The role of migration processes in dengue fever occurrence in Colombia: a mixed study approach

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I, Adriana del Pilar Pacheco-Coral confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

Background: Dengue is the second most important vector-borne disease in tropical regions largely affecting urban areas. Rural-urban migration increases numbers at risk. In particular, Internally Displaced Populations (IDPs) are forced to migrate through violence, conflict, or natural disasters moving to informal settlements in urban areas. IDPs might represent a pool of susceptible and vulnerable people; because of their cultural, socio-economic, and demographic factors that differ from the local people. Colombia has the third highest number of dengue cases in the Americas and the second largest IDPs number in the world.

Aim: To examine the relationship between IDPs and Dengue in Colombia.

Methods: A mixed methods approach was used including: policy and literature review; analysis of routinely available national-level data sources; quantitative household surveys of knowledge, attitudes, practices and vector counts in IDPs and host population households; focus group interviews with IDPs and host populations, and interviews with public health authorities and those working with IDPs.

Results: A range of policies addresses both dengue and IDPs in Colombia but there is no policy addressing both issues. Analyses of national level data showed that areas with high level of IDPs tended to have high levels of dengue. Household surveys showed that despite IDPs being more economically disadvantaged and having less access to education and health services, knowledge, attitudes, and practices were broadly similar, although IDPs households were more likely to obtain their information from community networking. IDPs households were more likely than host populations to have productive breeding sites for the vector in their households despite emptying and cleaning water containers more frequently. Participants were aware of dengue, but had mistaken knowledge about disease severity, treatment, transmission and effective control measures.

Conclusions: Dengue control in IDPs can be strengthened through community networking and integrated policies to increase access to health and education services.

Glossary

Aedes	Insecta from *Culicidae* family, it comprises 41 sub-genders and 1019 species. All species are vectors of dengue virus.
Antibody Dependent Enhancement	The antibodies from the primary infection respond in a cross-reactive way when a second infection (with other serotype) leads to a process in which the antibodies do not reach a neutralizing level against the new serotype
Arthropod	Invertebrate animal of the phylum Arthropoda, having a segmented body, jointed limbs and usually chitinous shell. Includes insects, spiders and other arachnids, crustaceans, and myriapods
Biologic control	Use of parasites and others microorganisms as natural predators of certain species aiming to keeping their populations in low amounts. For *Aedes aegypty*, biological control includes predatory fish, plankton management, copepods and Bacillus spp
Breeding sites	Place where female mosquito lays eggs for maturation and growing.
Community participation	Process of engagement people, authorities, diverse sectors and institutions in the planning, implementing, developing, and assessing health strategies and programmes aiming to have a bigger impact and strength any health system
Copepods	Small crustaceans discovered in 1981 as a predator of aquatic-stage mosquitoes; the first stage larva of mosquitoes is the favourite prey of copepods
Dengue vectors	Insects from order Hemiptera, family *Culicidae*, sub-family *Aedinae*, gender *Aedes*. In Colombia the vector species are *Aedes aegypti* and possibly *Aedes albopictus*.
Endemic	Present in a community at all times but in relative low frequency
Epidemic	A sudden severe outbreak within a region or group

Hyperendemic	For dengue, is the continue co-circulation of all dengue serotypes in the same area (which requires high levels of vector counts and a constant population's movement). This term also refers to the continue detection of epidemic outbreaks in a small geographic region (e.g., town, small city)
Illegal settlements (Colombia)	Are referred to clandestine areas occupied by squatters or illegal sellers -who use to sell houses in 'stolen' land, whose owners do not allow using it for any purpose. Informal settlements usually start as illegal (Palacios M. Between legitimacy and violence: a history of Colombia, 1875-2002. Durham: Duke University Press; 2006)
Informal settlements (Colombia)	Settlements built by informal builders who 'have not met the regulatory requirements' to build in the land. Some of those settlements could have utilities -because those are services, which could be acquired directly by people (Perez-Perez, 2012)
Insecticide	Chemical or biological molecules which eliminates vectors or avoids their contact with humans, and they have as targets any stage of vector's life cycle
Land ownership (Colombia)	Land legal entitlement of rural and urban land, which people get when buying land extension or flat/house.
Larvae and Pupae	Juvenile stages of arthropods. In this thesis these stages are called immature forms
Larviciding/larvicide	Insecticide eliminates larvae
National Development Plans	Plans which their approaches are directed towards the economic growth of the country, with emphasis on the planning process
Neglected Tropical Diseases	A group of seventeen infectious diseases which shared many common features, specially their prevalence in poor populations.
Population at risk of dengue	Individuals who live in endemic zones plus those who travel to endemic areas.
WHO regions	The WHO classifies the world in the following regions: African, American, European, Mediterranean, South-East Asia,

	and Western Pacific region. Subsequently, the Americas are divided in the Southern Cone, Andean, Central America and Mexican, Caribbean and Northern American sub-regions.
Vector	Biological intermediate host and vehicle of etiologic agent of a disease
Vector-borne disease	Illnesses caused by an etiologic agent which should be spread by arthropod

List of Acronyms

CEIS	Centro de Estudios e Investigación/Health Research Studies Centre - Fundación Santafé de Bogotá
CES	Centro de Estudios Sociales/Social Studies Centre – Universidad Nacional de Colombia
CI	Confidence Intervals
CODHES	Consultoría para los Derechos Humanos y el Desplazamiento Human Rights Organization focused on Internal Displacement due to conflict
COMBI	Communication and Mobilization for the Behavioural Impact
DALYs	Disability-Adjusted Life Years
DANE	Departamento Administrativo Nacional de EstadísticaColombian Statistics Department
DF	Dengue Fever
DHF	Dengue Haemorrhagic fever
DIVIPOLA	División Político Administrativa
	Colombian Political and Administrative Division
DPS	Departamento para la Prosperidad Social
	Colombian Agency for Social Inclusion and Reconciliation
EPS	Empresas Promotoras de Salud
	Companies for Promotion of the Health
GDP	Gross Domestic Product
IDP/IDPs	Internal Displaced Person/ Internal Displaced People
IEC	Information Education Communication

IGAC	Instituto Geográfico Agustin Codazzi
	Colombian Geographical Analysis Institute
IMS	Integrated Management Strategy
In	Natural logarithm
INS	Instituto Nacional de Salud
	Colombian national Institute of Health
IPS	Instituciones Prestadoras de Servicios
	Health Care Providers
IOM	International Organization for Migration
KAP	Knowledge, Attitudes and Practices
MDGs	Millennium Development Goals
NGO	Non-Governmental Organization
NTDs	Neglected Tropical Diseases
PAB	Planes de Atención Básica en Salud
	Plans of Basic Activities in Public Health
PAHO	Panamerican Health Organization
POS	Plan Obligatorio de Salud
	Health Care Plan
POT	Plan de Organización Territorial
	Colombian Territorial Organization Plan
RNA	Ribonucleic Acid
SDH	Social Determinants of Health
SEM	Servicio de Erradicación de la Malaria
	Malaria Eradication Service

SGSSS	Sistema General de Seguridad Social en Salud
	Colombian Social Protection System
SISDES	Sistema de Información sobre Desplazamiento Forzado y Derechos Humanos en Colombia
	Internal Displacement and Human Rights Information System
SIVIGILA	Sistema de Vigilancia en Salud Pública
	Colombian Public Health Surveillance System
SNS	Sistema Nacional de Salud
	National Health System
TDR	Research and Training in Tropical Diseases
UND	Unidad Notificadora de Dato
	Reporting Data Unit
UNDP	United Nations Development Programme
UN-Habitat	United Nations Human Settlements Programme
UNHCR	United Nations High Commissioner for Refugees
UPGD	Unidad Primaria Generadora de Dato
	Primary Collecting Data Unit
WHO	World Health Organization
WW2	Second World War

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Presentations based on this thesis

1. Pacheco-Coral A. Dengue in Colombia: policies, public health and community. Oral presentation at First UCL Americas International Postgraduate Conference, UCL Americas Research Network. London. 30 April - 1 May 2015.

2. Pacheco-Coral A, Quintero J, Hayward A. Assessment of dengue prevention and control guidelines implementation in an endemic Colombian area. Poster presentation at the Applied Epidemiology Scientific Meeting, Public Health England, Warwick University, 18-19 March 2015.

3. Pacheco-Coral AP, Vargas-Ruiz C, Hayward A. Análisis epidemiológico, espacial y temporal de la relación entre dengue y desplazamiento forzado en Colombia. Poster Presentation at the 16 Congreso de Investigación en Salud Publica, Instituto Nacional de Salud Pública de México-INSP, Mexico, 4-6 March 2015.

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Chapter 1 Introduction

This research focuses on the relationship between Internal Displacement and Dengue in Colombia. It uses a mixed methods approach including literature review, policy review, analysis of national routine data sources, and a field study including quantitative and qualitative methodology. This chapter intends to give an overview of the PhD project and the structure of the thesis document. The PhD's conception is placed in the context of my previous work in Colombia. The justification and the main hypotheses of this research are explained. Finally, the overall structure of this thesis document is presented.

Why choosing to research dengue and Internal Displacement in Colombia

Among vector-borne diseases[1], dengue is a very interesting disease to study because of its particular transmission patterns and its prevention and control measures. First, dengue is caused by a virus transmitted mainly in tropical and subtropical regions, occurs largely in urban areas, and is spread by a mosquito known as *Aedes aegypti*. This vector has different habits to the other mosquitoes such as breeding in fresh and clean water, and living within households in urban areas. Furthermore, dengue is the second most important vector-borne disease after malaria, and it produces fever in humans and other symptomatology including haemorrhages (chapter dengue). Given that *Aedes aegypti* lives with humans and there is not yet an available treatment for curing the disease, one of the main strategies for preventing and controlling dengue is community participation interventions[2] in which people are educated and trained in good practices of water storing. The majority of the countries affected by dengue have applied these types of interventions according to the World Health Organization (WHO) global strategy for preventing and controlling dengue.

[1] Vector-borne diseases are those infections that people can acquire through mosquitoes or insects such as malaria, yellow fever, and dengue fever. These diseases represent differential diagnosis of dengue disease in endemic areas.
[2] Term explained elsewhere in this document.

Colombia, my country of origin, is located in north-western South-America, crossed by the Equator, with mainly tropical weather and undistinguished seasons. According to the Departamento Administrativo Nacional de Estadística (DANE), “Colombia is divided in 32 states, 1,101 municipalities, 10 districts including the Capital Bogotá” (Departamento Administrativo Nacional de Estadística, 2012a). Its population is 48,202,617 and around 10% of it is IDPs. Through work as a Public Health Doctor in Colombia, I recognised the interaction between dengue and the social and environmental characteristics of populations and the potential role of Internal Displacement (which is the forcible migration of people within the borders of a country) in dengue epidemiology and control as an area requiring further investigation. Furthermore, I acknowledged the relevance of involving communities for studying that kind of factors might be drivers of dengue.

During my Masters in Public Health program, I undertook a study of the role of communities in dengue prevention and control using a cross sectional study, and semi-structure interviews for assessing knowledge, attitudes, practices, and community participation, using the WHO guidelines as a parameter to compare the main results with. The chosen city to develop fieldwork for that research project was a small city called La Dorada located 199 kilometres (km) from Bogota, the capital city of Colombia. La Dorada is located in an endemic area for dengue and it has been affected by armed conflict and by one of its consequences Internal Displacement. At the time of undertaking the fieldwork there, in spite of the governmental efforts to tackle Internal Displacement, most of the affected people lived in illegal or informal settlements located in neighbourhoods with low socio-economic conditions. It seemed that traditional factors of dengue had worsened within those neighbourhoods leading to dengue outbreaks, therefore I decided to do the cross sectional study in households located in three of these neighbourhoods.

A Knowledge, Attitudes and Practices (KAP) survey was applied and entomologic counts were assessed in 228 households (Pacheco-Coral, 2008). The survey evaluated dengue related knowledge and practices of participants, as well as their involvement in community participation interventions. Moreover, eight interviewees were selected from the cross sectional study using purposeful sampling to select people from the community and public

health staff. Interviews with community members addressed categories such as dengue knowledge, and people's attitudes towards dengue prevention and control. The interviews for public health workers assessed their role in dengue prevention and control at the local level. Furthermore, part of the information about social and economic conditions, and community participation was collected.

Results showed people's knowledge and practices may play a protective role as they may be related to not having high vector densities. Although the governmental intervention did not have sustainability, people were able to communicate their knowledge about dengue control in an effective manner (Pacheco-Coral et al., 2010). In this respect, it is also necessary to say that people's knowledge could slightly differ from the medical one, but in general people know about the disease, its vector, and how to prevent the disease. Some of the people could not establish the difference between dengue and other vector-borne diseases endemic in the area, and many of them identify dengue as a 'break-bone fever'[3]. Furthermore, La Dorada inhabitants had worked voluntarily on social networks and that experience let them try to solve their problems, especially those related to health. People had developed diverse community participation strategies either in partnership with the government or by themselves seeking to avoid dengue and prevent outbreaks. Thus, community participation interventions seemed to be effective in controlling dengue, and that is why these results made authorities aware of the relevance of community role in local dengue control policies. Finally, one of the most relevant finding was that people acknowledged that Internal Displacement may be related to the occurrence of infectious diseases such as dengue (Pacheco-Coral and Martínez-Parra, 2013).

Due to their relevance, these findings were presented in meetings in Colombia and abroad where I had the opportunity to interact with experts in the fields of dengue and migration. Those interactions allowed me to realise that globalization stimulates the spread of infectious diseases across and within continents in a rapid manner, especially affecting people who migrate and who live under vulnerable conditions. Consequently, I decided to

[3] Term explained elsewhere in this document.

investigate more about the role of Internal Displacement as a social determinant for dengue occurrence in Colombia. As a background for this PhD research, a brief review of the implementation of dengue control policies in La Dorada is given in chapter four.

Dengue and Internal Displacement in Colombia

Colombia has had cyclic dengue outbreaks in the majority of regions below 1,800 metres above sea level (m.a.s.l) since 1970. In the beginning of the new millennium, authorities revealed that 70% of Colombian territory has had dengue virus circulation, the dengue vector was found in 80% of the regions located between 1,000 and 2,200 m.a.s.l, and approximately 40% of Colombians were at risk of suffering dengue (Instituto Nacional de Salud, 2002). As a result, these conditions led Colombia to have in 2010 its largest dengue outbreak ever with 157,203 cases and 217 deaths (Padilla et al., 2012).

Regarding Internal Displacement, the censuses of IDPs have reached almost 10% of the Colombian population since 2002 (Consultoría para los Derechos Humanos y el Desplazamiento, 2011a). The main causes of people's forced migration were related to threats posed by illegal armed groups and violent processes of redistribution of the rural land, and in Colombia violence has been happening almost since the beginning of the XX century (Gonzalez Gonzalez, 2014). I consider in this dissertation that Colombian violence and its consequences are the result of four factors: 1) the division by classes inherited from the Spanish colonial time, 2) the prevailing regionalism rather than nationalism (which is also rooted in the classes' division), 3) the distribution of the rural lands across the country, and 4) the existence of political violence. Colombian violence and conflict situation are explained in chapter two, section three.

Bello (2004) considered that Internal Displacement due to armed conflict has occurred since the middle of XX century. Although different national policies for IDPs existed in Colombia, their socio economic conditions and wellbeing were affected. Public health policies had tried to give solutions related to their health conditions, however the

perpetuation of the Internal Displacement made the IDPs' health problems worse, especially those related to infectious diseases (Barceló Martínez, 2007). By 2011, Colombia was the country with the highest number of IDPs in the world (United Nations High Commissioner for Refugees, 2011) and there was speculation that IDPs suffered more infectious diseases in host cities, but there was scarce evidence supporting those hypotheses (Hernández-Bello and Gutiérrez-Bonilla, 2008, World Food Program et al., 2005, Salcedo Ramirez and Paredes, 2001). Specifically for dengue, the effect of both Internal Displacement in dengue occurrence, and community participation with inclusion of IDPs was not explored by 2011 in Colombia. Therefore, it seemed pertinent to develop a PhD project investigating the relationship between Internal Displacement and dengue, assuming that Internal Displacement could be a social determinant of dengue, and using a combination of methodologies for assessing that relationship.

Justification of this PhD

Why are social determinants relevant for assessing the occurrence of an infectious disease?

Several authors (Commission on Social Determinants of Health, 2008, Levins and Lopez, 1999) have claimed that diseases are caused by multiple determinants which are not only related to individuals, but also to communities, environment and the social, economic and political context. These claims have been posed through different global movements such as the Primary Health Care, Social Determinants of Health (SDH), the ecosystem health approach, the environmental justice, Health Care for All movement, the Latin-American social determinism, and the eco-social view (Peñaranda and Rendón, 2013, Commission on Social Determinants of Health, 2008, Levins and Lopez, 1999, Sevilla-Casas, 1989). Likewise, Levins and Lopez (1999) considered in a wide view that the determinants of health are part of a public health whole-system. According to these authors, the determinants of health are found at different levels (individual, family, society, city, state, country), are crossing different fields (social, economic, industrial, governmental, technological), are leading to different diseases because of their interconnectedness, and

are impacting in different ways the health of populations. Moreover, the WHO (2015a) defined the SDH as:

> The conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. The social determinants of health are mostly responsible for health inequities (World Health Organization, 2015a).

Sevilla-Casas (2008) considered that SDH shape the health conditions of populations because those determinants affect individuals immersed in populations who are connected through social and historical links. Therefore, individual factors such as age, sex, and ethnicity in addition to social and economic conditions, religious beliefs, disabilities and political positions make certain populations more vulnerable to being sick than others. Furthermore, the vulnerability varies from one population to another, according to the existent disparities among populations and between the contexts where populations are embedded.

To that extent and specifically for infectious diseases, several authors (Quevedo-Gómez et al., 2011, Sevilla-Casas, 2008, Karpati et al., 2002, Farmer, 2001) have agreed that these diseases are determined by factors which are not necessarily constrained to individuals and microorganisms, but rather, structural factors, related to the environment, economy, politics, and social conditions distributed at the local, national and global levels, which contribute to the emergence of infectious diseases, especially, among poor and vulnerable populations. The same authors (Quevedo-Gómez et al., 2011, Karpati et al., 2002, Farmer, 2001, Sevilla-Casas, 1989) have pointed to the relevance of studying these diseases in the light of the SDH and complex-systems for understanding the intrinsic biology of microorganisms, for taking into account people's interactions with the environment, and for considering the social, geographical and historical context in which people are embedded. SDH and complexity are used in infectious disease research to address the different political, social, and economic conditions, which drive health inequities among populations. For instance, Karpati *et al* (2002) hypothesized that the occurrence of infectious diseases, in comparison to other diseases, could be more affected by the social

economic conditions of the population and the context. So, it seems that infectious diseases are more likely to affect poor populations rather than populations with better economic conditions. These authors (Quevedo-Gómez et al., 2011, Sevilla-Casas, 2008, Karpati et al., 2002, Farmer, 2001) have also considered that the vulnerability of poor populations affected by infectious diseases is also mediated by the contexts where populations live. To that extent, disparities among and within countries might lead certain poor populations to be more afflicted by infections than others. That is why particular attention has been given to the unequal distribution of wealth as a driver of inequities which have a negative effect on the populations' health status, as well as acting as catalytic factors of the infectious diseases' emergence (Anand and Sen, 2000). Wealth inequities across countries, especially developing ones, are drivers of poor health and increase the risks of acquiring infectious diseases among populations (Farmer, 1996). However, given that these inequities are ubiquitous at the local, national, and global level, infectious diseases are not restricted to individuals who suffered them. These diseases represent threats for all of those who are at risk of acquiring them, and also for those who face barriers for accessing health care (Stansfeld, 2006, Anand and Sen, 2000, Porto, 1998, Farmer, 1996).

The WHO classifies dengue as a Neglected Tropical Disease (NTD) but this classification requires a critical understanding. According to Aagaard-Hansen and Chaignat (2010) the term 'neglected' means dengue has not been as relevant as malaria, tuberculosis or Human Virus Immunodeficiency (HIV) in terms of burden, therefore, dengue programmes do not obtain the same economic resources for research as other diseases do. Moreover, 'neglected' means dengue occurrence is mainly, but not exclusively, related to deprived and vulnerable populations located in low and middle-income countries. Lastly, neglected means dengue may have social determinants which have not been widely studied, and hence tackling those determinants has not represented a priority in the public agenda of affected countries. In addition, the WHO has targeted the NTDs in a special research program designed for studying diseases related to poverty (World Health Organization, 2015b). Bearing this in mind, the application of the SDH framework it seems appropriate to study Internal Displacement as a social determinant of dengue, and understand the vulnerability of both IDPs and locals to suffer this disease in endemic hosting urban areas. I

consider in this research that Internal Displacement might produce two types of vulnerability for dengue occurrence, on the one hand, the host city working as a complex-system and facilitating the 'interconnectedness' of several contextual determinants (Pacheco-Coral and Martínez-Parra, 2013, Ooi and Gubler, 2010). On the other hand, IDPs and their households might have several biological, social, and economic determinants of dengue acquisition. Therefore, this research describes the global processes influencing dengue occurrence, and investigates the Internal Displacement processes determining dengue using SDH framework.

How global forces might drive dengue occurrence among populations

Global processes such as economy, wars and conflict, migration and urbanization might lead dengue to affect poor and vulnerable populations. For instance, globalism and developmentalism pushes low and middle-income countries to implement industrialization with consequences such as the increase in economic disparities leading to poverty and the rise of rural-urban migration within and across countries (Guardiola-Rivera, 2010). It seems that especially after the Second World War (WW2) these processes of developmentalism and economic progress were enhanced and influenced policies for economic development in several countries. As Escobar (1994), mentioned WW2 consequences led to a global change in worldwide politics focus not only on the reconstruction of nations affected, but also on the development of poor nations located mainly in Asia, Africa and The Americas.

Since 1950s there have been proposed different policies for economic development, and around the decade of 1970s many of these policies were fully implemented in low and middle-income countries. As a result, the worldwide Gross Domestic Product (GDP) per capita has increased 8 times more since 1950 (Giraldo et al., 2009), but in Latin America[4] that increase was faster, on average 3.1% per year, between 1950 and 1970 (Guardiola-

[4] Although low and middle income-countries are mainly located in Asia, Africa, and Americas, I mention examples of Latin America aiming to bring a context about the region were this research took place.

Rivera, 2010). The economic growth in Latin America was followed by a rapid process of urbanization from 1950 and 2000 (Giraldo et al., 2009), with 84% of its population living in cities by 2006. However, these economic achievements did not translate into an equal and fair distribution of wealth, on the contrary, poverty worsened specially among those populations which could not integrate in the economic model and did not adopt the modern model of values. For instance, indigenous and ethnic groups changed their sources of income and trade systems as well as their lifestyles (Escobar, 1994). For Guardiola-Rivera (2010) this means that if individuals from those groups wanted to be integrated in the new economic system, they needed to abandon their ancestral customs so that they could adopt modern ones.

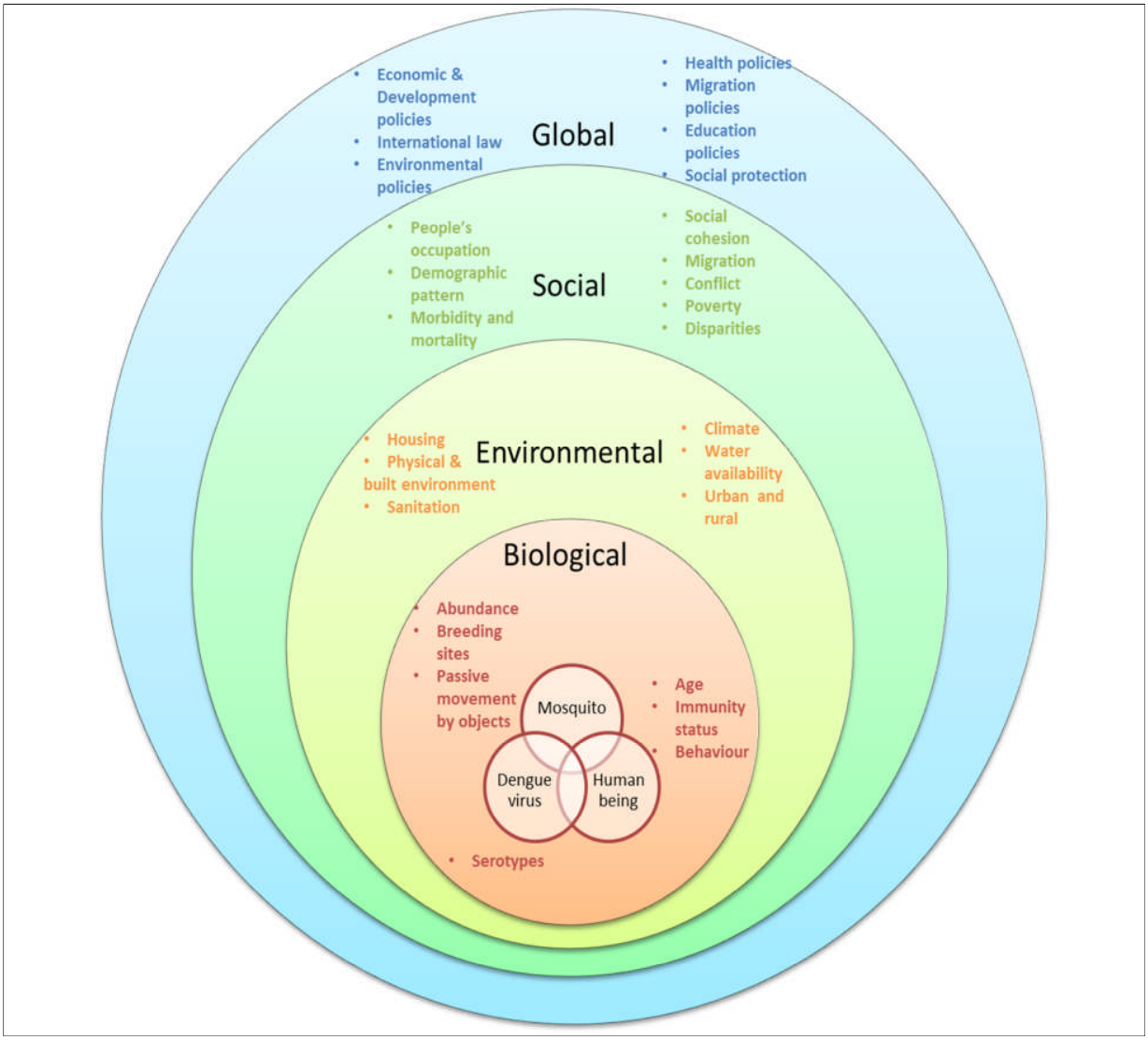
Not surprisingly, in Latin America many people moved from the countryside to settle in cities where this new lifestyle would be possible to achieve. Especially people moved to cities economically developed or politically powerful (e.g., capital cities) where it would be easier to find job opportunities (Giraldo et al., 2009). However, many of the rural migrants have settled in peri-urban areas facing barriers to access housing, jobs, healthcare services, and education (chapter two, section three). According to the United Nations Development Programme (UNDP) last report (2014), the number of households with economic insecurity reached more than a million worldwide. Those households are mainly located in low and middle-income countries where income inequalities have increased up to 11% by 2010. The report also said that “there are more than 200 million migrants around the world generally vulnerable community facing limited formal protection” (United Nations Development Programme, 2014, p22). On top of that, the rise of modern conflicts is also a driver of rural-urban migration forcing people to migrate and settle in the peri-urban or slum-like areas of cities. The United Nations High Commissioner for Refugees (UNHCR) (2014) stated that by the end of 2013, an estimated 51.2 million of people were forced to migrate worldwide, and Latin America is hosting the 2nd highest amount of forcibly displaced people and nearly 80,000 refugees (chapter two, section three).

Additionally, Ooe and Gubler (2010) considered that WW2 consequences such as rural-urban migration and rapid urbanization allowed the dengue virus to circulate easily and

faster in South-eastern Asia, especially in urban areas with a high population density, with many people living in slum-like settlements, and with a lack of housing offer and lack of infrastructure. Bearing this situation in mind, it should be considered that peri-urban areas might represent a new environment where non-typical urban vectors, microbes, and diseases become urban ones. As an example given by Vasilakis *et al* (2010), dengue virus has shifted from infecting non-human primates to becoming a human vector-borne disease, and has adapted to its new host after the introduction of human activities (such as large-scale agriculture, livestock rearing, and natural resource exploitation) and human settlements in tropical forest areas. The dengue vector shifted from living in tropical forests to urban environments located in tropical regions, given that its breeding sites are containers with clean and fresh water easily found within human households, furthermore, this situation is accentuated by infrastructural disparities in urban areas (Gubler, 2004). For example, an interrupted pipe water service, irregular sewer systems for draining rainwater, or irregular waste collection services might lead people to store water in containers or rain to form artificial water collections in waste, and both situations lead to *Aedes aegypti* potential breeding places. According to Suchitra Nimmannitya (Economist, 1998), *Aedes aegypti*'s wide distribution is a "man-made" problem as he considered that the expansion of dengue has been enhanced by urbanization and human travelling. Taking this statement into account, this research will explain how human Internal Displacement (due to conflict) might impact dengue occurrence in endemic urban areas.

In the previous paragraphs, it was illustrated how political, economic, and other global forces might drive dengue among populations. Then, is necessary to describe how these forces may influence the role of SDH determining dengue in urban settings at different levels. For a further guidance please refer to figure 1:

Figure 1 SDH related to dengue at four different levels



(Author's own, 2015)

How Internal Displacement processes might affect dengue in urban settings

I hypothesise that the SDH at different levels (global, social, environmental and biological) (see Figure 1) which IDPs face in comparison with locals might lead migrants' health problems to rise in host urban places. Therefore, if migrants are more vulnerable than locals, they might suffer severely any illness, and if this situation continues during long periods of time eventually locals would be prone to sickness too. Alirol *et al* (2011) have

stated that the urban space itself works as a 'web of interconnected determinants' (Alirol et al., 2011), p132) in which factors such as social and economic disparities, population demographics, and environmental conditions could converge and contribute to infectious disease transmission among individuals. For the case of dengue, Aagaard-Hansen and Chaignat (2010) considered that the SDH related to the disease are "water and, migration, the socio-economic context, vulnerability, health care outcomes, consequences of poverty, and sanitation" (Aagaard-Hansen and Chaignat, 2010, p145), which are typical determinants found in urban areas. In addition, Focks (2003) hypothesised that the introduction of people who have never been exposed to the virus (such as migrants) to endemic areas might increase the probabilities of epidemics, circulation of virulent strains and severe consequences of the disease. For example, according to Ooe and Gubler (2010) in South East-Asia during the WW2 the movement of the soldiers and troops across borders eventually led 'to provide susceptible hosts' (Ooi and Gubler, 2010), p135) for virus transmission. Urban setting as recipient of migrants has also served as a new environment for dengue virus transmission. For example, some authors (Vasilakis et al., 2010) have described how sylvatic[5] dengue virus strains in the early 1900s had caused epidemics in South-eastern Asian port cities, affecting especially recent immigrants.

At the social level, it is necessary to take into account that migration processes are not only referred to the fact of move from one place to another, but also to the conditions pre and post movement, (chapter two, section three). In the case of IDPs, Ruíz-Ruíz (2008) considered that in Colombia Internal Displacement is closely related to urbanization processes and economic development, and even though Internal Displacement is a consequence of violence and disparities, it has contributed to the processes of shaping cities and national industrial growth. Moreover, it is possible that and the demographical changes due to IDPs influxes might influence dengue endemic waves in host urban settings. In this extent, Ruíz-Ruíz (2008) acknowledged that IDPs are demographically different to both voluntary migrants and locals, because in forcible migration there is not a willing desire to leave the place of residence and to settle in the destination one. So, IDPs do not

[5] Occurring in wild animals and spreading among humans when people enter in contact with the sylvatic vector.

have the opportunity to plan the migration neither to prepare themselves for the new conditions in cities. Moreover, IDPs are more likely to follow rural customs and values than adopt the urban ones, and as a result they have different patterns of fecundity, mortality and morbidity than voluntary migrants and locals. Moreover, IDPs households tend to be composed mainly of adult women (who are mainly responsible for the running of the household) and children, thus these households have health related needs which are different from locals ones.

Stoddard *et al* (2013) described how human movement in Peru influenced the transmission of dengue in a hyperendemic urban area. This follow-up study showed how dengue was spreading in different neighbourhoods of the city, when non-infected people visited neighbourhoods where there had had active dengue cases. Whether people visited areas with active cases and a high amount of vector, they were more likely to contract the disease there in comparison with their own household or neighbourhood. Likewise, the risk for any person to acquire dengue was greater in certain clusters of households or areas characterized by high movement of people through the day than within people's households. Other authors (Barmak et al., 2011) have hypothesized that human movement might enhanced dengue epidemics, because this help mosquitoes could easily spread the disease when humans with dengue move from one place to another. These results might suggest that the movement of people constitute a factor for dengue occurrence in endemic urban areas, and this is important when considering the movement of people due to Internal Displacement towards and within hosting cities. Apostolopoulos and Sönmez (2007) mentioned how mobile populations are generally affected by different factors that make these populations different from locals:

> Migrating populations are oftentimes faced with further poverty, discrimination and exploitation, alienation and a sense of anonymity, limited access to social services, separation from families, and separation from the sociocultural norms that guide behaviour in stable communities (Apostolopoulos and Sönmez, 2007, p8).

Bearing those factors in mind, it is necessary to mention how IDPs face a complex situation when arriving to host cities. First they arrive with little or virtually no money or assets, in

other words, IDPs face more material deprivation even compared to the urban-poor, and also they do not have easy access to education, the job market, and healthcare services (Jacobsen, 2014). Second, the IDP status has a stigma when the forcible displacement is due to conflict, thus, IDPs might face difficulties in creating social cohesion and social networks with locals. Third, IDPs face barriers to access social protection[6] either by inadequate governmental response or by their lack of awareness about their rights. As a consequence of these differences among IDPs and locals, the vulnerability of the former to suffer dengue could be related to worse socio-economic conditions, to IDPs' difficulties in building social networks with locals, and to IDPs scarce participation in local initiatives towards dengue prevention and control.

At the environmental level, there are other SDH to consider when IDPs arrived to urban settings because rapid urbanization might cause environmental disruptions due to unplanned settlements. Therefore, rapid urbanization drives a host city to be organized as a collection of settlements where people from different economic conditions live together. For instance, peri-urban areas or slum-like settlements are spaces where IDPs and the urban-poor coexist together sharing the same infrastructure without having the same access to adequate housing, because host cities might not cope with the emergence of informal settlements and inadequate housing where IDPs live. Thus, there would be infrastructural disparities between IDPs and locals. For instance, non-adequate housing conditions, such as inadequate material for tropical weather or inadequate housing design, may lead to unhealthy conditions, and consequently, to an accelerated completion of *Aedes aegypti* life cycle and to a high virus transmission among humans (Organización Panamericana del Salud, 2009, Gubler, 2004). For example, a house with poor ventilation (not enough windows) allows the rise in temperature which has an effect on the rate of vector emergence, and the lack of window nets might allow the entrance of adult mosquitoes looking for humans to bite. Furthermore, overcrowding might increase *Aedes aegypti* biting frequency leading to a high virus transmission rate among household

[6] Holzmann and Jørgensen (2000) define social protection as 'the political decisions intending to provide income security to people which allow them to have the minimum of socio-economic conditions for living' HOLZMANN, R. & JØRGENSEN, S. 2000. Manejo Social del Riesgo: Un nuevo marco conceptual para la Protección Social y más allá. *In:* MUNDIAL, B. (ed.). Washington, USA.

residents. Inadequate waste disposal inside the household and surroundings may lead to an increase in *Aedes aegypti* breeding sites. Therefore, the provision of domiciliary utilities' services is crucial, but this provision might not be available in situation of rapid urbanization and emergent informal settlements. As another example of this situation, the poor rubbish collection service facilitating the accumulation of waste becoming rainwater collections, and lack of a good sewer network might increase outdoors rainwater collections due to not enough drains in the streets. Both types of collections represent potential *Aedes aegypti* breeding places.

At the biological level, SDH might be influencing the triad vector-virus-humans in urban settings; the infrastructural disparities in utilities coverage especially pipe water networks might influence the behaviour of people towards water storage (Quintero et al., 2009). This situation might lead IDPs to be more exposed to potential breeding places for the dengue vector, and also restrict hyperendemic zones in host cities to peri-urban areas or slum-like settlements. Nevertheless, in Latin American urban areas the neighbourhoods could share the same utilities coverage in spite of their economic conditions. As an example, it is possible to find good provision of piped water networks and rubbish collection services in informal settlements, as well as in middle-income or rich neighbourhoods (Giraldo et al., 2009). This situation could indicate that *Aedes aegypti*'s breeding pattern is not just related to infrastructural but also to other determinants, indeed, whether rich neighbourhoods are located next to poor and slum-like settlements, biological factors might determine dengue transmission. For example, biological differences in immune systems due to the nutritional status related to disparities in food security may be important. The vulnerability of IDPs in host cities might be mediated by their increased biological susceptibility for acquiring dengue. According to Guzmán *et al* (2010), susceptible populations (like migrants) have dengue attack rates oscillating between 40 to 50%, moreover, other authors (Ooi and Gubler, 2010) have also mentioned that the R_0[7] could range from 1.3 to 11.6 according to suitable conditions, susceptible individuals, circulation of more than one virus strains, and high amount of mosquitoes. The

[7] Number of dengue cases after the introduction of one single case in a susceptible population.

majority of these conditions might be found in informal settlements of urban areas where IDPs and urban-poor live, and those conditions could both lead IDPs to be more vulnerable for acquiring dengue and to keep active cases in deprived zones within urban areas. Additionally, whether rich, middle-income, and poor people are located next to each other in endemic areas might contribute to dengue transmission in epidemic outbreaks. Research shows how the greatest prevalence of Immunoglobulin M (IgM) antibodies to dengue virus (indicating recent infection) was among the very poor people, but the greatest prevalence of Immunoglobulin G (IgG) (indicating historical infection) was among the rich people, suggesting that all the population have been exposed to dengue virus at least once in their life (Honorio et al., 2009, Caprara et al., 2009) but that poor people are more likely to have been recently exposed.

Main question, aims, and design

In spite of the Colombian government's efforts to tackle dengue, social determinants such as Internal Displacement might increase the vulnerability[8] of certain populations to acquire the disease. IDPs have been forced to leave their lands, properties, money, and towns arriving without any assets to host places which have not been prepared to contain this emergent situation. As a result, IDPs are usually located in illegal and informal settlements, under precarious conditions, lacking food safety, employment, health insurance, and education all of which might lead them to live in households with inadequate materials for tropical zones, to store water without good practices, to be more exposed to mosquitoes, and to be more at risk of not accessing healthcare facilities when ill. Thus, it seemed appropriate to investigate the social and economic determinants and their potential effect on dengue, as well as the traditional determinants of dengue that might be worsened among IDPs hosted in urban areas.

Bearing that in mind, the main question of this research is examining to what extent it can be argued that Internal Displacement is a factor in determining dengue epidemiology and

[8] Term explained elsewhere in this chapter.

control amongst populations within an endemic urban area in Colombia. Addressing this question requires a pragmatic stance[9] given that dengue is a dynamic event driven by several determinants ranging from biological and environmental to complex ones such as global changes and economic forces. It seemed relevant to use mixed approaches, quantitative and qualitative ones, aiming to assess the effect of Internal Displacement on dengue occurrence and control among Colombian populations settled in endemic urban areas. In order to explore the use of either qualitative or quantitative methods were apply to address SDH in dengue research, a review of the literature was undertaken including thirty nine papers and using different techniques described in appendix 1.

Mixed methods and dengue: overview of the studies reviewed

The majority of these studies aimed to evaluate programmes, to assess sustainability, to test new technologies, to evaluate the feasibility of interventions, to evaluate community participation interventions, and to engage communities for tackling dengue. For instance Tran *et al* in Vietnam (2015), Murray *et al* in Thailand (2014), Jones *et al* in Mexico (2014) and Leon-Cabrera *et al* (2013) in Cuba have assessed the sustainability and the acceptance of using biological control or insecticide impregnated nets and clothes to avoid *Aedes aegypti*. Other studies developed in Latin America (Basso et al., 2015, Marroquin et al., 2014, Cordeiro da Silva et al., 2013, Castro et al., 2012, Sanchez et al., 2012, Vanlerberghe et al., 2009, Toledo Romani et al., 2007, 2006, Mosquera et al., 2006, Sanchez et al., 2005, 2004, E Luna et al., 2004, Chiaravalloti Neto et al., 2003, Winch et al., 2002, Soto-Hernandez J et al., 1995) and Southeast Asia (Suwanbamrung et al., 2013, Subramaniam et al., 2012, Lennon, 2004, Win et al., 2004) have evaluated the role of communities towards dengue prevention and control, and these studies have ranged from assessing KAP and studying social factors related to public engagement to mobilizing community members and society sectors. Additionally, an innovative approach known as ecosystem research (Special Programme for Research & Training in Tropical Diseases, 2015) has been developed in

[9] Although system theory terminology such as complex-system and whole-system are used in this thesis, aiming to illustrate multiple determinants of dengue and different levels in which the disease occurs, complexity is not the philosophical stance for this research.

several countries in Latin America (Caprara et al., 2015, 2009, Padmanabha et al., 2010, Quintero et al., 2009, Suárez et al., 2009) and Asia (Abeyewickreme et al., 2012, Arunachalam et al., 2012, Tana et al., 2012, Wai et al., 2012a), and these studies have included the assessment of KAP, social factors, and environmental determinants of the disease. Many of them have also used community engagement and empowerment for implementing interventions (Training in Tropical Diseases 2015). Few studies assessed validity of dengue surveillance such as the ones developed by Prasith *et al* (2012) in Laos, Barreto *et al* (2012) in Brazil, and Jefferson *et al* (2008) in French Guyana. Moreover, a multi-country study (Barniol et al., 2011) sought to evaluate if the current dengue classification allows accuracy in dengue diagnosis and if it could be applied to retrospective data.

The studies reported the use of different qualitative and quantitative tools such as surveys, questionnaires, trials, interviews, focus and discussion groups, public engagement activities, and other anthropological and sociological techniques. Actually, studies developed in Cuba (Castro et al., 2012, Sanchez et al., 2012, Vanlerberghe et al., 2009, Toledo Romani et al., 2007, 2006, Sanchez et al., 2005, 2004) and in the ecosystem initiative (Caprara et al., 2015, 2009, Abeyewickreme et al., 2012, Arunachalam et al., 2012, Tana et al., 2012, Wai et al., 2012b, Padmanabha et al., 2010, Quintero et al., 2009, Suárez et al., 2009) have tried to gather professionals and technicians from different areas aiming to have multidisciplinary insights. In summary, these studies combine methods aiming to have a more comprehensive understanding of dengue determinants and to engage communities as key participants in dengue prevention and control. Many of these studies were done in concordance with the WHO global strategy for preventing and controlling dengue (World Health Organization, 2012), and a table summarizing the studies can be found in appendix 2. Taking into account the relevance of combining methods when studying dengue, it seemed relevant to design this PhD study according to the most accepted methodology for mixed method studies.

Mixed methods in this research

Creswell (2007) brought a widely accepted definition of mixed method:

> A method focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (Creswell, 2007, p7).

Mixed method designs could be classified according to Creswell (2007) typology in two main groups: sequential and concurrent designs. The former refers to using a qualitative or quantitative approach followed by the approach that was not applied in sequence, and the latter refers to use of both approaches at the same time in parallel. In addition, according to Tariq and Woodman (2013) the mixed method sequential and concurrent designs could be sub-classified into 4 types: triangulation, embedded, exploratory, and explanatory depending on the weight that qualitative and quantitative approaches have in any stage of the research process (See Table 1).

Table 1 Different type of mixed methods study designs

Mixed method design	Description	Integration of methods
Convergent -also referred as 'current triangulation' (Rauscher and Greenfield, 2009)	"Quantitative and qualitative methods used concurrently" (Tariq and Woodman, 2013, p5)	Through the design
Explanatory sequential	Quantitative data are collected first, and then qualitative method tries to explain quantitative findings	Results level
Exploratory sequential	Qualitative data are collected first and its findings are tested or	Results level

	generalized in the quantitative method	
Embedded	One method is predominant and usually contains the other method which has a supportive role	Design level

Modified from (Tariq and Woodman, 2013, Creswell, 2007)

The review of mixed method studies in dengue, mentioned before, indicates that concurrent designs were used only in five of the studies, for instance in the Vietnamese study (Tran et al., 2015) aiming to assess sustainability of the use of biological control within households. Likewise some of the Cuban studies (León Cabrera et al., 2013, Toledo et al., 2006) and the ecosystem approaches (Quintero et al., 2009, Suárez et al., 2009) applied this type of design aiming to have more impact on mobilizing and engaging communities. In contrast the majority of the authors preferred the sequential (Jones et al., 2014, McNaughton and Duong, 2014, Azmawati et al., 2013, Prasith N et al., 2012, Suwanbamrung et al., 2013, Abeyewickreme et al., 2012, Arunachalam et al., 2012, Barreto et al., 2012, Castro et al., 2012, Sanchez et al., 2012, Subramaniam et al., 2012, Tana et al., 2012, Barniol et al., 2011, Hernández Quiñones et al., 2009, Jefferson et al., 2008) and embedded designs. Some studies using sequential designs were done back in the 1990s or the early 2000s in countries located in Latin America (E Luna et al., 2004, Sánchez et al., 2004, Chiaravalloti Neto et al., 2003, Winch et al., 2002, Soto-Hernandez J et al., 1995) and Southeast Asia (Lennon, 2004, Win et al., 2004).

Bishop (2015) said that sequential designs are suitable for researchers who want to use mixed methods but cannot develop great-scale studies investing many resources. For example, these studies are suitable for single researchers, such as postgraduate students, who want to combine methods for answering a research question. In addition, some authors (Pluye et al., 2009) have said that complementarity, comparability, exploration, and confirmation are good reasons for choosing sequential designs. Likewise, in the review of mixed method studies in dengue some authors have considered the same reasons to

justify their designs. Although other authors have chosen embedded designs for the same reasons, they have also included a wide range of multi-disciplinary groups and developed a multistage implementation like Cordeiro de Silva *et al* (2013) and Sanchez *et al* (2004). Bearing all these reasons in mind, the selected design of this research is a sequential exploratory design divided in 5 phases explained in chapter methods and likewise the phases are linked to the chapters of this thesis.

Overall structure of the thesis document

This thesis has eight chapters which follow the structure displays in table 2. A description of each chapter, as well as its purpose and main characteristics are given. From chapter 4 onwards, chapters are organized following the sequence of levels global, social, environmental and biological aiming to explain the role of migration processes as a SHD of dengue occurrence and control (See Figure 1).

Table 2 List of chapters

Chapter 1: Introduction
Chapter 2: Literature review
Section 1: Dengue
Section 2: Colombia general information and description of social protection policies
Section 3: Migration processes
Chapter 3: Overview of methodological framework
Chapter 4: Policies in dengue and migration
Segment 1: A case study of policies implementation in dengue
Section 2: Internal Displacement
Chapter 5: National data analysis
Chapter 6: Results from fieldwork in Colombia part 1
Section 1: Detailed methods
Section 2: Socio demographic characteristics of participants and health system barriers
Chapter 7: Results from fieldwork in Colombia part 2
Section 1: Water usage, water-filled containers, and dengue vector abundance
Section 2: Practices, knowledge, and attitudes towards dengue
Chapter 8: Conclusions

Chapter 2: Literature review

Section 1: Dengue

This section covers background information on dengue including: definition, epidemiology, burden, prevention and control, and vector control.

Section 2: Colombia general information and description of social protection policies

This section includes a brief description of Colombia and its social protection system. This chapter aims to explain Colombia's main features (e.g., geographical, social, demographical characteristics), and also to explain how the general population access social protection.

Section 3: Migration processes

This section covers the definition and background of migration used in this thesis, as well as the related topics such as types of migrants, Internal Displacement definition, Migrants' health, IDPs health, and finally the description of the Colombian conflict and Internal Displacement.

Chapter 3: Overview of methodological framework

This chapter describes the five-phase sequential design chosen for this research relating each phase with the corresponding chapters and sections within this document. Moreover, it gives detailed information about benefits and challenges found when developing every phase of this research. Detailed methodological points for each phase are briefly described in chapters four, five, and six.

In addition, this chapter aimed to bring the reader a general idea about the research design and how the quantitative and qualitative methods were combined within the research. Moreover, the collaborative work that was developed with institutions and researchers in Colombia and UCL is explained. I clarify the extent of this original work and the contributions of collaborations with other researchers in chapters four, five, six and seven.

Chapter 4: Policies in dengue and migration

This chapter aimed to describe the implementation of dengue polices in the city of La Dorada (where my Master's fieldwork took place back in Colombia) as a background for understanding how changes in policies may affect the dengue prevention and control programmes. Moreover, this chapter includes a brief summary of Internal Displacement policies at the international level and in Colombia.

Chapter 5: National data analysis

This chapter included the results of ecological and space-temporal correlations of dengue and Internal Displacement in Colombia. The purpose of this chapter was to characterize the distribution of dengue cases in Colombia and their relationship to Internal Displacement, as well as other broader environmental and infrastructural factors. The chapter also included a detailed description of the secondary sources of information and the types of data used.

Chapter 6 and 7 aimed to integrate the two approaches (qualitative and quantitative) for examining the data and the results. So, data was analysed separately using appropriate quantitative and qualitative software, and a second analysis was performed using the technique 'following a thread' described by O'Cathain *et al* (2010). Finally, the results were integrated when writing the results.

Chapter 6: Results from fieldwork in Colombia part 1

Section 1: Detailed methods

In this section, detailed information about the process for sampling IDPs, the KAP survey design, the entomological survey, and the techniques for mixing results are explained.

Particularly, for undertaking fieldwork, it was necessary to work with other researchers not only for academic reasons, but also for concerns about the safety around reaching IDPs. Hence, a selection of potential urban areas where researchers had been investigating dengue was done, and a checklist for selecting the study place was applied. It was decided the fieldwork should be conducted in a dengue endemic region, with existing research infrastructure.

Criteria for selecting the fieldwork's study place

The city of Armenia was chosen as the study place for several reasons: first, Armenia is located in the Andean region, 283 km from Bogota, on the shore of Quindío river at 4°32", at latitude and longitude 75°41". Its altitude is 1,483 m.a.s.l and its average temperature is 20°C, these conditions make Armenia suitable for dengue occurrence. Moreover, this city is considered one of the 10 high-risk municipalities for dengue transmission in the country. As Padilla *et al* (2012) stated, Armenia's dengue rate is six times more than the national rate and contributed an average of 2,000 cases/year for the period 1999-2010, furthermore, Armenia is considered as a hyperendemic city for dengue transmission. Second, in 2013 its population was 293,614 and 87.8% of it was located in urban areas, whose conditions fitted with the desirable size of the population and economic development. Third, Armenia's migration pattern has been characterized by fluxes of voluntary and forced migrants, and Ruíz-Ruíz (2007) stated that Armenia has become one of the major receptor centres for IDPs since 1950. By the end of 2013 Armenia was one of the 10 top cities hosting displaced people in the country, and local authorities revealed that the city received around 20,644 IDPs from 2000 to 2013 (Unidad para la Atención y Reparación Integral de las Víctimas, 2013). Finally, Armenia fulfilled sufficiently secure conditions to develop fieldwork there. Other important characteristics about the city Armenia are explained in detail in the section.

Section 2: Socio demographic characteristics of participants and health system barriers

This section includes the main socio-demographic characteristics of the participants and also data about barriers faced by IDPs for accessing healthcare services. Quantitative and qualitative data are integrated to inform main findings.

Chapter 7: Results from fieldwork in Colombia part 2

Section 1: Water usage, water-filled containers, and dengue vector abundance

This section includes information about water usage, water storage and vector counts collected through the KAP survey, the entomological survey and qualitative methods. The analysis describes number of containers per household, water-filled containers per household, infested containers among IDPs and non-displaced households, and proportion

of infested containers with water. Qualitative categories related to every topic are integrated with quantitative results.

Section 2: Practices, knowledge, and attitudes towards dengue

This section displays more qualitative and quantitative insights of practices towards water, frequency of emptying water-filled containers, knowledge and attitudes towards dengue amongst participants, and perceptions about governmental activities for controlling dengue are given.

Final words

Dengue and Internal Displacement are dynamic events driven by multiple epidemiological, social, and environmental determinants. In the case of dengue, the discovery of a new strain of the virus, the application of new technologies for vector control (such as the release of mosquitoes genetically modified), the awareness of the *Aedes albopictus* (efficient dengue vector) widely geographic distribution (European Centre for Disease Prevention and Control, 2015), and the launch of a tetravalent vaccine in 2014, as well as, the acknowledgement of the potential zones for dengue transmission (e.g., Europe and UK) (Medlock and Leach, 2015) due to climate change in 2015, show how dengue is a continuing and changing challenge for public health requiring inputs from different disciplines in order to tackle it. Likewise, Internal Displacement has been changing during the past years, for instance, until 2014 Colombia held the highest number of IDPs in the world. However, conflicts and deterioration of security conditions in Middle East have led to a rise in the number of IDPs in Syria (as will be mention in chapter two, section three), and also, other economic, environmental, religious and political forces have driven people to flee their countries and become illegal migrants, refugees, or asylum seekers. Moreover, the Colombian government legally recognized IDPs accounts in 2013, and by the same year the government started a peace process with the guerrillas aiming to finish the armed conflict. Both governmental decisions were important for IDPs to claim and enjoy their legal rights, and to return to their places of origin.

Bearing this in mind, this research required combining methods for assessing the relationship of Internal Displacement and dengue using different disciplines, so that it could provide new insights about the Internal Displacement role as a social determinant of dengue. This research could bring new perspectives to dengue occurrence at urban areas hosting IDPs not only for Colombia, but also for other countries affected by both events. Finally, this research could contribute in the areas of knowledge, such as migration and health and NTDs, aiming to bring recommendations for decision makers.

In the next chapter, a background in dengue, Colombia's characteristics, and migration processes description are given aiming to contextualize this research in current information about these topics.

Chapter 2: Literature review

Chapter 2, Section 1: Dengue

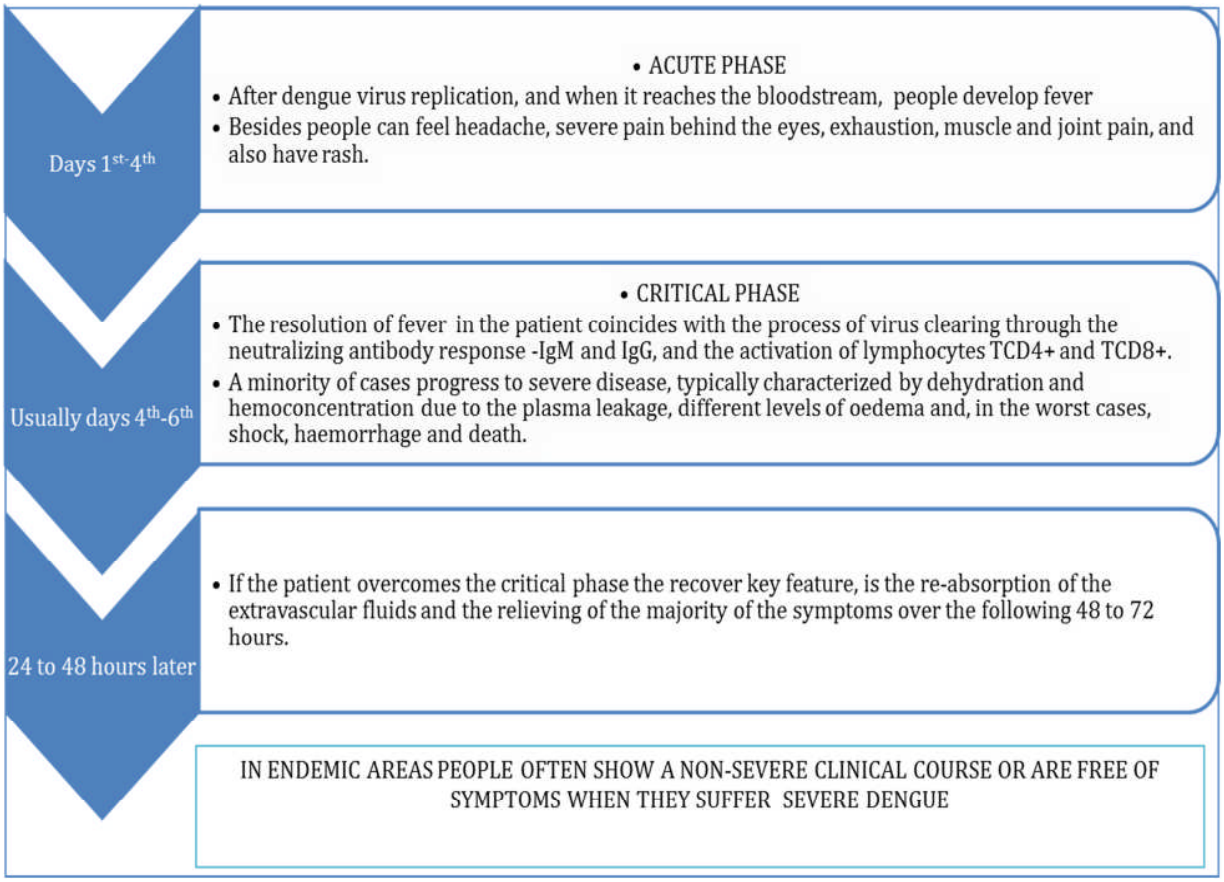
In this section information, about the virus, the epidemiology and distribution of the disease, the mosquito that spreads the disease, and the dengue prevention and control programmes is summarized.

Dengue : the disease

Dengue is an arbovirus from the Flaviviridae family which is a 50 nanometres Ribonucleic Acid (RNA) molecule, containing 3 structural proteins, C, prM and E. The latter is a glycoprotein that allows the virus to invade the host cells. Moreover, the virus has 7 non-structural proteins, and comprises 4 serotypes and 5 genotypes (World Health Organization, 2009). Researchers have described e genotypes 2 and 3 as the most virulent and shown that these can displace the less virulent ones in different regions. Apparently, dengue virus evolved in Southeast-Asia before spreading to the rest of the world (Rico-Hesse, 2010).

Dengue virus incubation lasts 10-14 days with its life cycle starting when the virus enters phagocytic cells (Swaminathan and Khanna, 2009, Murrell et al., 2011). The different stages of disease are shown below:

Figure 2 Clinical phases of dengue



Modified from (WHO, 2012)

Apparently, the primary infection by one serotype induces lifelong immunity to that serotype, but not to further infections caused by others. Severe illness is much more likely to occur in a second infection with another serotype. It is thought that this event is related to an aberrant pathogenic immune response called Antibody Dependent Enhancement (Murphy and Whitehead, 2011, Swaminathan and Khanna, 2009, Murrell et al., 2011).

The World Health Organization (WHO) (2009) classifies dengue in two categories[10] used for clinical, epidemiologic, and public health purposes as displayed in the figure below:

[10] In this section dengue is called DF (Dengue Fever) and severe dengue is called DHF (Dengue Haemorrhagic Fever) aiming not to lead to miss-understandings when the document is read. However, the current classification only considers the terms dengue and severe dengue.

Figure 3 WHO dengue-case classification

Dengue (DF)	Severe dengue (DHF)
Febrile, critical and recovering phases without complications	One or more of the following findings: • Plasma leakage that may lead to shock (dengue shock, and/or fluid accumulation, with or without respiratory distress) • Severe bleeding • Severe organ impairment

Author's own elaborated with data from (WHO, 2012)

Epidemiology

Dengue is a vector-borne disease and the size of the population at risk of suffering it has increased to approximately 3.9 billion people worldwide (World Health Organization, 2012), due to the geographical expansion of its vector (*Aedes aegypti*) and the co-circulation of the 4 serotypes (Murrell et al., 2011, Kyle and Harris, 2008). Dengue is endemic in at least 100 countries, which are located in 5 WHO regions, except Europe (World Health Organization, 2009, Suaya et al., 2009) (See Figure 4).

Figure 4 Dengue rates in five WHO regions

Dengue rates (including DF and DHF cases) across 5 WHO Regions				
South-East Asia	Western Pacific	Americas	Mediterranean	African
Region reporting dengue episodes/100,000 Period 1988-2010	Most affected countries and areas reporting incidence rates/100,000 By 2009	Region reporting incidence rates/100,000 Period 1980-2007	Non available data	Just data of countries affected by outbreaks
• 1988 = 18,000 • 1992 = 15,000 • 1996 = 21,000 • 2000 = 10,000 • 2004= 28,000 • 2008 = 45,000 • 2010 = 65,000	1. American Samoa =643.6 2. Cook Islands =1,089.7 3. French Polynesia =921.6 4. New Caledonia =3442.6 5. Tonga =262.5	1. 1980-9 =16.42 2. 1990-9 =35.88 3. 2000-7 =71.1		
Source: Undurraga EA, Halasa YA, Shepard DS. Use of Expansion Factors to Estimate the Burden of Dengue in Southeast Asia: A Systematic Analysis. PLoS neglected tropical diseases. 2013;7(2):e2056.	Source: Region WHO-WP. Dengue in the Western Pacific Region 2013 [cited 2013 March]; Available from: http://www.wpro.who.int/emerging_diseases/Dengue/en/index.html#	Source: San Martín JL, Brathwaite O, Zambrano B, Solórzano JO, Bouckenooghe A, Dayan GH, et al. The Epidemiology of Dengue in the Americas Over the Last Three Decades: A Worrisome Reality. The American Journal of Tropical Medicine and Hygiene. 2010;82(1):128-35		Source: Amarasinghe A, Kuritsky J, Letson G, Margolis H. Dengue virus infection in Africa. Emerging Infectious Diseases. 2011;17(8):1349.

Author's own elaborated with data from (Undurraga et al., 2013, World Health Organization, 2013, San Martín et al., 2010, Amarasinghe et al., 2011)(Undurraga et al., 2013, World Health Organization, 2013, San Martín et al., 2010, Amarasinghe et al., 2011)

It is suggested that nearly 50 to 100 million cases of DF occur every year, and from those, 250,000 to 500,000 individuals suffer DHF (Suaya et al., 2007) (See Figure 5).

Figure 5 Worldwide dengue cases distribution 2000-2007

Dengue cases distribution across 5 WHO Regions between 2000-2007				
South-East Asia	Western Pacific	Americas	Mediterranean	African
Number of DF cases in the region as a whole	Most affected countries and areas (greatest to lowest number of DF cases):	Most affected countries and areas (greatest to lowest number of DF cases):	Most affected countries and areas (This region has just reported outbreaks)	Most affected countries and areas (This region has just reported outbreaks)
1. 2000 = 50,000 2. 2001 = 200,000 3. 2002 =200,000 4. 2003 = 120,000 5. 2004 =120,000 6. 2005 =180,000 7. 2006 = 190,000 8. 2007 = 250,000	1. French Polynesia =37,667 2. Fiji =25,859 3. New Caledonia =14,270 4. Cook Islands =7,590 5. Palau =3,146 6. Wallis and Futuna =2,648 7. American Samoa =2,310 8. Kiribati =2,143	1. Brazil =1,634,588 2. Colombia =702,235 3. Mexico = 534,226 4. Venezuela =501,043 5. Cuba =351,442 6. Honduras =251,237 7. Puerto Rico =196,448 8. Costa Rica =180,035 9. El Salvador =132,881 10. Ecuador =126,641	1. Pakistan 2. Saudi Arabia 3. Sudan 4. Yemen	1. Senegal 2. Cote d'Ivoire 3. Cape Verde
Countries with higher frequencies of DF cases might not have the same distribution of DHF cases. The occurrence of DHF is more related to high endemicity of dengue, co-circulation of different serotypes, and the rising of vector accounts and susceptible individuals.				

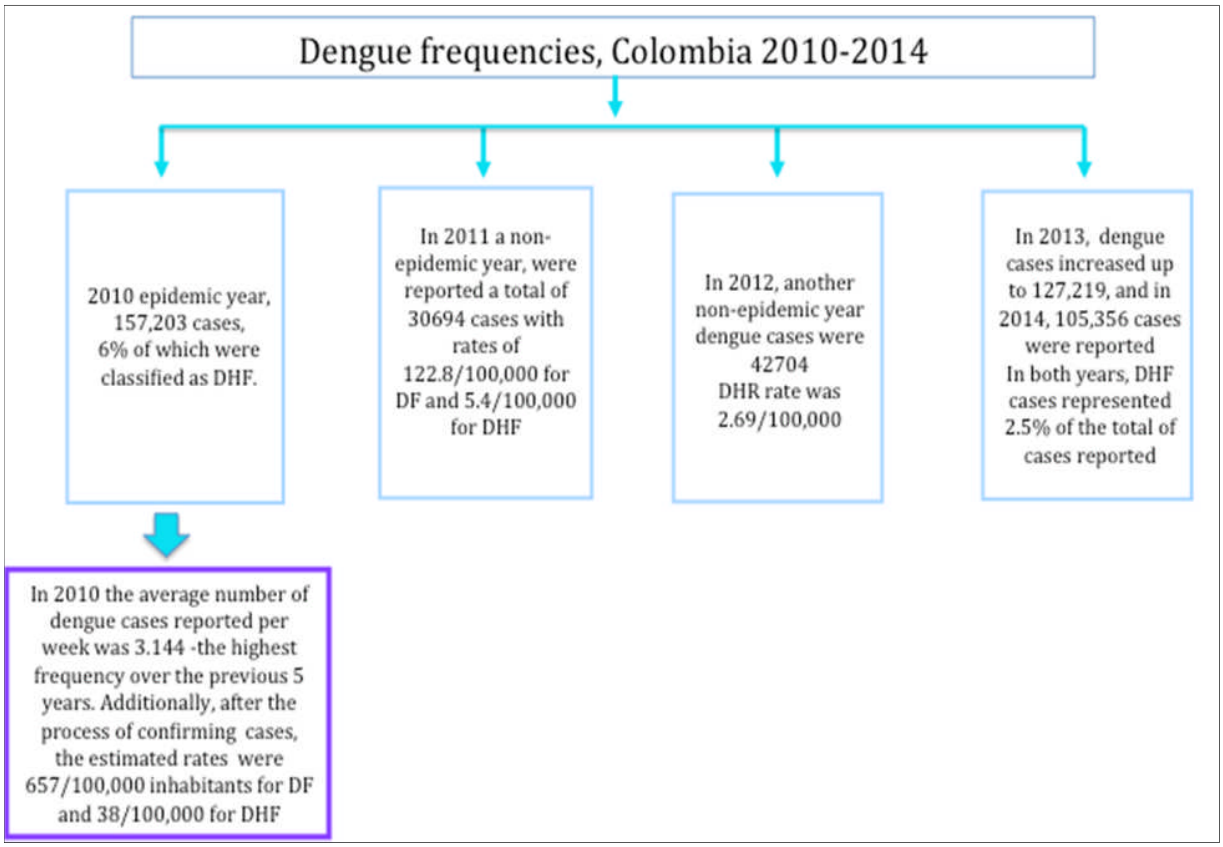
Author's own with data collected from (World Health Organization, 2009, Suaya et al., 2009)

Particularly, for the American region the number of reported dengue cases has shown a marked increase since the 1980s after the re-infestation of *Aedes aegypti* and co-circulation of all serotypes in the region (San Martín and Brathwaite-Dick, 2007) (except for the Southern Cone region where Dengue Virus Serotype 4 did not circulate). Moreover, cases have doubled every ten years. Not surprisingly, in 2009 some Argentinean municipalities had dengue outbreaks in zones where dengue transmission had not occurred for several years, but which were next to hyperendemic zones (Zambrini, 2011). According to some experts (San Martín et al., 2010), the Southern Cone and Andean sub-regions contributed the highest number of dengue cases. In the 1990s, the Andean region reported most cases. In the period 2000-2007 both sub-regions have a similar number of reported cases, though the highest dengue rate was in the Southern Cone region. During the same period, the regional rate for DHF cases was 1.7/100,000.

Although 63% of cases in the Americas are reported from Brazil, Colombia has the third highest number of both DF and DHF cases (Pan American Health Organization, 2015), and also Colombia is in the eight position of most endemic countries in the world (García-Betancourt et al., 2015, World Health Organization, 2012). Dengue Virus Serotype 2 and Dengue Virus Serotype 1 have circulated whereas Dengue Virus Serotype 3 re-emerged in 2004. Dengue Virus Serotype 4 was identified in 1984 and has been often reported since then (Pacheco-Coral, 2004, Usme-Ciro et al., 2008). In Colombia, at least, 620 municipalities are endemic and approximately 50.5% of the general population are at risk of acquiring dengue (Rojas, 2011). During the period 2000-2010, dengue cases showed an upward tendency reaching 157,203 cases in 2010 (see Figure 6) (Padilla et al., 2012), and it is hypothesized that this epidemic was largely driven by climate changes such as the El Niño and La Niña phenomena[11] between October 2009 and December 2010. Another important factor was the population density in endemic cities which might lead to have more susceptible individuals for acquiring the virus. Until 2009, it seems that the dengue epidemics in the country had presented certain seasonal pattern in endemic areas, however by the 2010 epidemics almost all the country was affected reaching a geographically expansion rate of 90.% (Villar et al., 2015b, Padilla et al., 2012). In addition, 2013 and 2014 were epidemic years presenting a constant number of severe dengue cases.

[11] Characterized by periods of alternating heavy rain and extreme droughts.

Figure 6 Colombian dengue data



Author's own elaborated with data collected from (Pan American Health Organization, 2015, 2014, 2013 , Villar et al., 2015b, Padilla et al., 2012, Rojas, 2011, Bello-Perez, 2011)

Burden

The WHO is trying to estimate the number of Disability-Adjusted Life Years (DALYs) lost to dengue; however, this task is not easy given that some regions underreport the number of cases.

Suaya *et al* (2007) summarize different burden studies; a Puerto Rican one found the DALY loss was approximately 658/million population/year. This estimate resembled the DALY loss for many other infectious diseases during the period 1984-1994. Likewise, in Latin America the dengue DALY loss was similar to tuberculosis in the same time-period. Another study in South-east Asia estimated 420 DALYs/million population/year lost; this

was similar to the DALY loss for meningitis, double that of hepatitis and 1/3 of Human Immunodeficiency Virus DALYs. A different study estimated 528,000 global dengue DALYs in 2001. In total 264 DALYs/million population/year, for 2 billion people living in areas at risk of dengue.

Dengue is relevant not only because of its health-related outcomes, but also because of its costs. A few cost-effectiveness studies conducted in Latin American countries during 2005-2006 have revealed that, on average a single ambulatory case had 14.8 lost working days and a single hospitalized one 18.9 days. In terms of societal costs, 514 American Dollars (USD$) expenses were calculated for an alive ambulatory patient and USD$ 1491 were calculated for an alive hospitalized case. Taking into account the risk of death, for both type of cases, the costs increase to USD$ 828 more (World Health Organization, 2009).

Regarding the economic burden the following examples show how dengue represents a costly problem in endemic regions:

Figure 7 Dengue: public health and illness-related costs

Cost of dengue ($USD)									
	Thailand (1994)	South-East Asia	Indonesia (1998)	Malaysia (2002)	Singapore (2000)	Puerto Rico	Latin American countries (1997)	Caribbean islands (1997)	Colombia (2011)
Direct patient cost or societal cost (travel, food, lodging)	630	70.64				125			
Health system costs	45.56								705
Vector control per-capita cost	0.081		0.015	0.24	2.4		0.020-3.560	0.140-8.490	

Author's own elaborated with data collected from (Suaya et al., 2007 , Castañeda-Orjuela et al., 2012)

Another study, done in Latin American and Asian countries from 2004 to 2007, shows how these costs vary greatly. For instance, when comparing Gross Domestic Products (GDPs), an

ambulatory patient does not have the same cost in Venezuela where a case has on average a disease-leave of 12 days, as in Brazil where a case has on average a leave of 31 days. Likewise, the cost varies whether the patient is hospitalized; in Venezuela the average hospitalization days is 45 on average, whereas in Cambodia it is 110 (Suaya et al., 2009). It is unclear to what extent these represent genuine differences or differences in methodological approaches to studying the economic consequences. Nevertheless, the study done in Colombia (Castañeda-Orjuela et al., 2012) calculated the costs for dengue cases in 2011 and it found that the management of dengue illness cost USD $16.9 million, the vector-control program costs oscillated from USD $37 million to USD $42 million and a societal cost per capita of USD $12.86.

Prevention and control

Many possible approaches to tackle dengue have been suggested ranging from drug-treatment and vaccines to effective vector-control. It should be noted that specific anti-viral treatment is not currently available.

Treatment

Treatment is focussed on management of symptoms and supportive care for critical cases. However, some possible treatment options have been explored such as host and viral protein-inhibitors. These specific inhibitors aim to diminish the virulence of the microorganism, and allow the immunologic system to enhance its function. Inhibitors include drugs which have been used against other viruses and have showed efficacy for those infections. Oligomers affecting specific viral nucleotides have been tested on mosquitoes and live-tissues (Swaminathan and Khanna, 2009). In common with other acute viral infections it seems that treatment is likely to be minimally effective unless taken very early in the course of the illness. The costs of such treatment are also likely to be prohibitively high for low or middle-income countries.

Vaccine

At the end of the year 2014, the trials for one of the tetravalent dengue vaccine prototypes were completed, and the results indicated the efficacy of the vaccine against dengue virus. The vaccine reached safety standards when was tested in children of five Latin-American countries (Villar et al., 2015a). Yet, these results cannot be generalized to other populations, until new studies demonstrate that the vaccines will be safe for all the people living in endemic areas as Thomas (2015), in his editorial for the New England Journal of Medicine, stated about Villar's study in Latin America. Further research in this area is needed as well as studies about cost-effectiveness of the vaccine and community acceptance of it for dengue prevention.

Vector

Aedes aegypti is a mosquito which needs clean water for breeding purposes (Gubler, 2004). This contrasts with the Anopheles mosquito (the malaria vector), which prefers water collections with great amounts of organic material. Its life cycle has four stages, 3 of them are aquatic (egg, larva and pupa) and the last one is aerial (adult mosquito). The mosquito can complete the three aquatic stages in a variety of water containers and vessels (Marquetti et al., 2005). Female mosquitoes bite humans in order to get a blood meal to finish her oogenesis. Once *Aedes aegypti* gets dengue virus, through infected blood, it remains infective for the rest of her life. Intermediate hosts for dengue virus transmission among humans living in urban settings have been not yet identified, although the virus can be transmitted in primates in sylvatic areas (Vasilakis et al., 2010).

Environmental conditions and vector replication

The environmental factors that might modulate the *Aedes aegypti* life cycle are temperature and rainfall. Higher temperatures reduce the gonotrophic cycle of the female mosquito,

which in normal conditions lasts three days after the bloodmeal. In each cycle, the female *Aedes aegypti* can incubate 100 eggs. However, when the gonotrophic cycle is short, a female mosquito has more frequent egg-laying episodes and bites more humans to obtain blood. The female mosquito lays her eggs on the surface of clean water of different containers, and in a humid and hot environment the development of *Aedes aegypti* embryo takes 48 hours. The eggs can survive desiccation and also remain stuck to the container walls, even when the water level decreases. If the eggs survive, they become larvae and this stage lasts 7-14 days. Larvae feed on organic residues that they find in the water. The pupa is the final water stage and only lasts 2-3 days. When, the adult mosquito emerges and before starting to fly, it remains for a couple of hours on the walls of the container before starting to fly (Organización Panamericana de la Salud, 1995).

Human behaviour is also a modulator of the mosquito cycle when changing the water in the container (Ooi and Gubler, 2010, Organización Panamericana de la Salud, 1995). For example, the more people change the water from a targeted container, the average number of *Aedes aegypti* pupa decreases inside the container (Padmanabha et al., 2010). Likewise, the study done in La Dorada (Pacheco-Coral et al., 2010) found a relation between the frequency of washing water-filled containers, and the decreased counts of *Aedes aegypti* .

Vector control

Across the world, the first *anti-aegypti* campaigns were focused on insecticides. In 1946, in Latin America the majority of the campaigns used dichlorodiphenyltrichlorethane (DDT) for killing adult mosquitoes. However, those campaigns were partially successful and eventually they failed due to their high cost and unsustainability. Then, *Aedes aegypti* DDT-resistant variants re-infested the region in the 1960s (Hernández et al., 2002, Organización Panamericana de la Salud, 1995). Currently, the use of insecticides, for spraying streets and houses is generally restricted to outbreaks, or when severe dengue cases are reported to avoid vector's insecticide resistance (Ocampo et al., 2011).

However, some countries, included Colombia, promoted vector control strategies within people's houses. Examples of those strategies were washing the containers holding water, as well as lidding vessels and containers, using larviciding products aiming to interrupt the vector lifecycle (Hernández et al., 2002). Later on, the WHO promoted the Integrated Management Strategy (IMS) that had community participation as a key strategy (See Figure 8).

Figure 8 Integrated Management Strategy

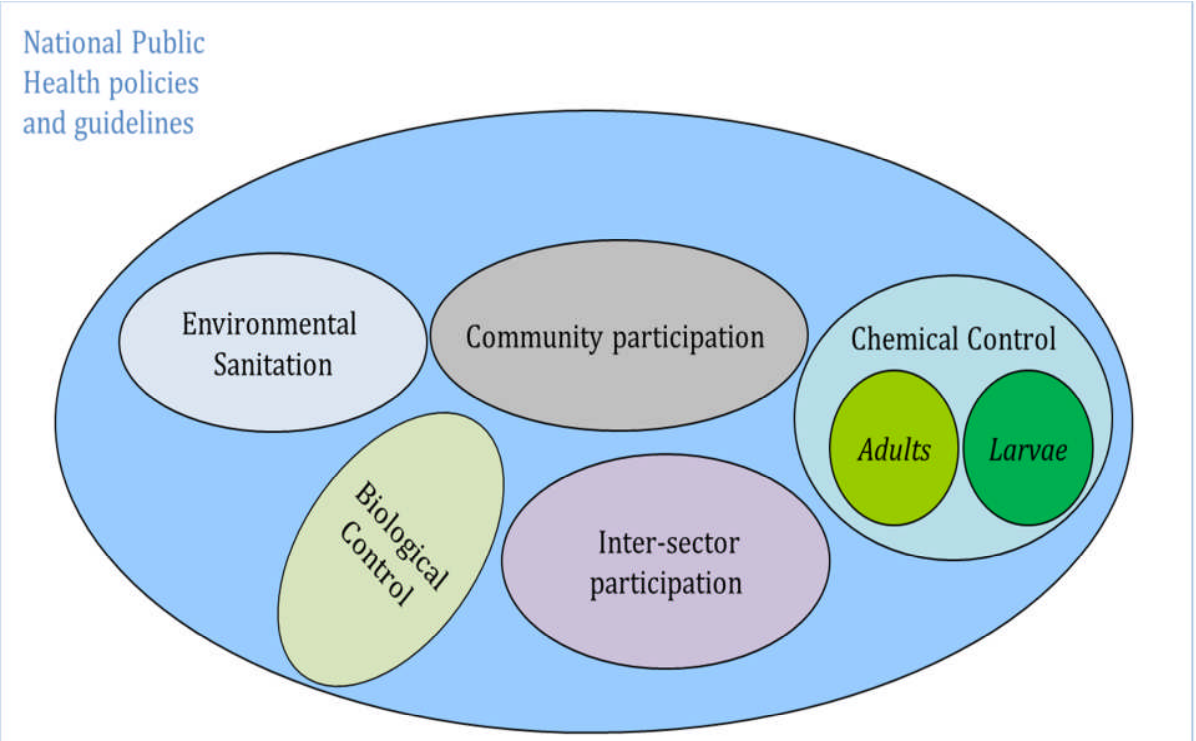


Chart designed by the author with information adapted from WORLD HEALTH ORGANIZATION, 2009. Dengue: guidelines for diagnosis, treatment, prevention and control.

The WHO Global strategy for dengue prevention and control is focused on 5 different steps '1) sustainable vector control, 2) diagnosis and case management, 3) integrated surveillance and outbreak, 4) future vaccine implementation, and 5) basic operational research' (World Health Organization, 2012). Below, three of those steps are described in

order to understand what type of knowledge and attitudes towards dengue are expected among peoples living in endemic areas.

Firstly the sustainable vector control, which is considered a crucial step by the WHO for preventing and controlling dengue, promotes a rational use of insecticides along with other type of interventions. One of those interventions is community participation which is an alliance between health authorities and affected communities aiming to communicate dengue knowledge, and to inform about dengue's prevention and control activities. Two of the most used interventions are the Information Education Communication (IEC) and Communication and Mobilization for the Behavioural Impact (COMBI) (See figure 9). Although IEC and COMBI are methodologically different, both of them are based on social mobilization and use mass media and community networks in order to reach the affected population.

Figure 9 IEC and COMBi strategies description

IEC	COMBI
Primary healthcare strategy which aims to change people's behaviours from target populations during a specific period of time. IEC is based in a multidisciplinary approach in which the individual is considered a client according to the social marketing. In addition, communication theory, behaviour analysis, anthropology, and pedagogic design are also in this strategy. (World Health Organization, 2001)	Strategy looking for planned people's mobilization and improved communication mechanisms for preventing and controlling communicable diseases. COMBI has the following phases for implementation 1. Planning 2. Development 3. Surveillance (Parks and Lloyd, 2004)

Secondly, for the WHO the correct classification and management of dengue cases is another important step. Hosrtick *et al* (2012) indicated that the classification is not only used by doctors, but also by public health authorities aiming to control dengue at the population level. Therefore, community participation interventions are also focused on describing dengue symptoms in order for people to recognize the disease and seek medical aid promptly. In addition, a raised awareness might lead health workers to provide support to the case, to identify signs of severity, to hospitalize cases with severe dengue, and to

prevent and control outbreaks (Win et al., 2004). It seems that in highly endemic regions, people either think that dengue is not a serious illness or they confused it with other diseases (Suarez et al., 2005, Arunachalam et al., 2012). People are not totally aware of the lack of dengue treatment, and they mistakenly consider that there is a specific medicament for treating the disease (Pacheco-Coral and Martínez-Parra, 2013). In spite of this inaccurate knowledge people think that dengue is a problem for their communities, and also they acknowledge the risk of dengue spreading if there are dengue cases near to them (Quintero et al., 2009, Arunachalam et al., 2012).

Thirdly, the WHO is also committed to avoiding outbreaks throughout the strengthening of active mosquito surveillance and control. According to Brochero and Quiñones (2008), the entomologic surveillance should contribute to having a clear identification of vectors and their habits in endemic zones, to complement the dengue prevention and control activities using detailed local information, and to measure the impact of those activities using the vector counts reduction as an outcome. Therefore, many of the community interventions also aim to train people in identifying the vector in both its immature and mature forms. As well as in knowing the vector life cycle enabling people to be engaged in dengue control activities. The main knowledge promoted is that *Aedes aegypti* is a black and white dotted mosquito which needs clean water for breeding purposes, is adapted to the indoor environment, and has adapted to live alongside humans (Gubler, 2004).

Finally, for the WHO and different dengue experts (World Health Organization, 2012, Horstick et al., 2012) community engagement is critical to develop the three steps described above; however, there are still disagreements among researchers about people's level of participation. For Heintze *et al* (2007), when people observe that dengue knowledge could be used for preventing it, they try to be engaged in activities with the health authorities. Other researchers (Pacheco-Coral, 2008, Toledo et al., 2007) have stated that many of the community participation interventions lack good evaluation, feedback and follow-up. That is why it is important to explore people's opinions about governmental actions, strategies and programmes, as well as their thoughts about the different levels of responsibility (individual, communitarian, societal, governmental, local, national, and

international) for controlling dengue. It should be highlighted that several authors have considered that the prevention and control of dengue represent multi-sectorial responsibilities which require collaborated work among several individuals and institutions (Heintze et al., 2007, Periago and Guzmán, 2007, Parks et al., 2004).

Biological control

By the 1990s, many countries had tested diverse biological control (Kosiyachinda et al., 2003). On the one hand, *Aedes aegypti* natural predators, such as copepods and fishes, have shown good results. For instance a type of copepod, *mesocyclops*, demonstrates not only being a good predator but also being sustainable in biological tests done in tires and domestic containers. Vietnamese researchers (Kay et al., 2002) have highlighted the good results of using *mesocyclops* for dengue control regardless of the size of the water-tank. They state that because of their dietary patterns *mesocyclops* can eat *Aedes aegypti* larvae as much as they want, but also they do not depend on the continued supply of larvae to survive. Typically fish have been used by villagers and authorities in many countries, because of their good predator activity against *Aedes aegypti* and other mosquitoes; however, according to some authors (Nam et al., 2000, Pacheco-Coral, 2008) some people are still reluclant to have fish in their water tanks. Additionally, *Bacillus thurigiensis* var. israelensis (Bti) is widely used in several vector control programmes instead of chemicals pesticides (Boisvert and Boisvert, 2000). However, Bti's action may vary deppending on the mosquito feeding habits and its maturity stage; as well as on factors such as the amount of larvae, organic pollution, vegetation and the temperature in the water. Finally, it should be said that the cited studies have demonstrated that biological control works better when it is linked to community participation.

Larviciding products

In addition of Bti, other chemical products could be applied in water-filled containers such as organophosphorus pesticides and insect's growing regulators. One of the

organophosphorus products is temephos in granules which has been widely used as a control of *Aedes aegypti* (World Health Organization, 2011b), and one of its commercial brands most used is ®Abate (BASF, 2015). According to Colombian vector-control guidelines (Ministerio de la Protección Social, 2011), temephos should be used in water-filled containers which are exposed to environmental conditions, without lidding, and which could not be easily intervened (e.g., cleaned frequently). Temephos' effect lasts up to 3 months in water-filled containers eliminating immature forms of the vector (larvae).

Entomologic surveillance

Depending on the approach of the surveillance method, it is possible to assess each one of *Aedes aegypti stages* through diverse indexes. When the aim is assessing the productivity of the mosquito Breteau, Container and House Indexes can be used (see Figure 10) (Focks, 2003). On the other hand, the rate of emergence of adults may vary according to conditions and these indexes do not provide a direct measure of dengue transmission risk (STRICKMAN and KITTAYAPONG, 2003, Focks, 2003). Instead of them, the use of pupae counts and the estimation of a pupal/demographic index have been proposed. According to some experts (Marquetti et al., 2007), the counts and the index are relevant because containers with higher pupae counts are potential reservoirs of adult mosquitoes. Additionally, pupae counts could be used as a proxy measurement of dengue spreading.

Figure 10 Entomologic indexes used in compulsory surveillance

House Index	Container Index	Breteau Index
Percentage of houses infested with larvae and/or pupae	Percentage of water-holding containers infested with active immature	Number of positive containers per 100 houses

(WHO, 2012)

Finally, since 2003 the WHO has promoted the Integrated Management Strategy (IMS-dengue) which includes community participation, equitable healthcare access, laboratory and diagnostic testing, cross institutional leadership, entomologic and insecticide-resistance surveillance, and vector control (World Health Organization, 2009).

Environmental change and dengue

Some authors (Marmot et al., 2012) pointed out that the world health equity is threatened by global climate change. Specifically for dengue, global climate change is likely to extend the areas at risk. Moreover, the vast deforestation of tropical forests, such as the case of the Amazon, has led changes in the micro-climate at the local level that affect the changes in temperature and rainfall (Castro, 2003). According to the United Nations Development Programme (UNDP) (2011) climate change will lead to 260-320 million people suffering from malaria and even more suffering from dengue by 2080. On top of that, global climate change also could allow changes in both the virus and mosquito, leading to effective transmission of more virulent strains (Rico-Hesse, 2010).

Regarding the mosquito life cycle, both the lower and the higher temperatures during a day are relevant factors. Generally, the mosquito survival rate remains stable between 20-30 ºC and the female mosquitoes tend to bite in both the early morning and evening. In addition, several studies indicate the heat island effect which can raise the temperature in the surroundings of the houses located at a neighbourhood, especially in the late evening, because of the excess of warmth produced by several sources in an urban environment (Rydin et al., 2012, de Schiller, 2011). It should be highlighted that the temperature might modulate the mosquito's life cycle and the virus tranmsission (Rico-Hesse, 2010). It also seems that rainfall modulates the emergence of the mosquitoand this effect could depend on the number of containers available to store clean water (Padmanabha et al., 2010). For instance, rubbish disposal practices may lead to the accumulation of containers in close proximity to houses that can collect rain water and act as breeding sites (Caprara et al., 2009). *Aedes aegypti* breeding ability is influenced by factors such as the temperature

(inside houses and containers) the degree of shade and the architectural design of both the house and yard (Focks, 2003).

Other authors (Ooi and Gubler, 2010) have suggested that global warming might have an effect on dengue through changes in human behaviour, the increase of rural-urban migration, and the unplanned urbanization rather that changes in the environment. Rico-Hesse (2010) indicated that dengue incidence in developing countries could be more affected by human interactions and human relationship with the environment, given that dengue control mostly relies on people's behaviours, especially those related with water usage, and frequency of vessel cleaning and lidding.

Sanitation in dengue control: the role of water management

As it was stated before, water management has currently a crucial role in dengue control in urban areas. This topic is not new as it was addressed since the first campaigns against the *Aedes aegypti* mosquito were implemented to control yellow fever at the end of XIX century (Williams, 1994). However, there are some authors (Quevedo et al., 2004, Casas-Orrego, 2004, Williams, 1994, Cueto, 1992) who have stated that in Latin America there were difficulties to implement adequate and efficient pipe water coverage in urban areas where diseases such as yellow fever were endemic. On the one hand, in places where there was a pipe water network working, there were interruptions of the service which made people to distrust in the service and to store water (Williams, 1994). On the other hand, in other places where there was not pipe water, there were cistern systems and aqueducts inherited from colonial times (Casas-Orrego, 2004) which also led people to store water in veseels.

In Colombia, some rural areas located near economic relevant urban centres had rural aqueducts which covered the pipe water service (Saldias-Barraneche and Jaramillo-Cardona, 1999). These types of initiatives were led mainly by associations of agricultural producers, peasants, and governmental institutions. However, there were disagreements

about which insitutition was responsible of the provision of sanitation as a public health measure since the beginning of XX century (Casas-Orrego, 2004). It seems that only until the mid-1900s, the Colombia government officially invited other non-health related professionals to work on the environmental sanitation of the country (Yepes-Luján et al., 1990). Nonetheless, environmental sanitation was prioritized in cities given that there were centres of economic development. Moncada-Mesa *et al* (2013) stated that in 1962 the Colombian government created the Programa de Saneamiento Basico Rural (Basic Rural Sanitation Programme) which built rural aqueducts and allowed communities to manage them in collaboration with some governmental institutions. Additional information about piped water service in Colombia is given in section three of this chapter.

Finally, it is not a surprise that the water tank culture has been preserved in Colombia because of the problems generated by the historical inadequate piped water coverage in the country. Nevertheless, this custom has brought problems to tackle dengue in endemic areas[12], as well as the inadequate mangament of disposable items and rubbish inside the households which may collect water (e.g., rain water). Following the WHO dengue control guidelines, the Colombian public health authorities have promoted adequate management of containers for storing water. Basically, it is sought that people wash water tanks frequently, cover the containers with lids, avoid having unnecessary stored water or collections of clean stagnant water, and discard rubbish and old items (Hernández et al., 2002).

Final words

In this section, the main characteristics of dengue disease, one of the relevant topics for this PhD, were summarized. In the next section, the main features of Colombia, country were this research took place, are described. Important details to help in understanding the

[12] Situation that is similar in countries located in The Americas and Asia, in areas where there are problems for providing uninterrupted pipe water service and dengue is also endemic.

characteristics that made Colombia and relevant place to study dengue and its relationship with migration are given.

Chapter 2, Section 2: Colombia: general information, medicine, and public health

In this section, main characteristics of Colombian geography, territory, governmental organization, population, and history of medicine, public health, and disease control are described.

Geographical aspects

Colombia is located in South America, has coasts in the Caribbean and Pacific oceans, and is crossed by the Equator. The area of the country is 1.142.000 km^2 with 2,900 km of maritime area. Agricultural and mineral productions with economic purposes are linked to Colombia's five geographical regions (Andean, Amazon, Caribean, Oricono-Plains, and Pacific), and these regions are divided according to natural borders. Every region has its own biological characteristics which gives the country a great biodiversity in flora, fauna and ecosystems.

Colombian state organization

Colombia is a democratic, decentralized country with a central government composed of the president and the parliament, which has two houses. The government has three main branches: the executive, the legislative, and the judicial, and through them the central government ensures the organization, structure and functioning of the state. In addition, each one of the thirty-two states has a governor and each one of the 1,101 municipalities has a mayor, and both states and municipalities have their own cabinets. The municipality works as the smallest executive unit, and it can take its own decisions in regards to annual budget's expenditures and implementation of programmes and strategies. Table 3 summarizes the characteristics of Colombian territorial organization.

Table 3 Territorial Organization of Colombia

Territory Division	Definitions and regulations
State	According to article 298 of the current Colombia Constitution (1991): It is a territorial entity that enjoys autonomy for management, and planning and promoting economic and social development within their territory -under the terms established by the Constitution and the laws. States exercising management, coordination, mediation between the nation and the municipalities and other services determined by the Constitution and the laws (Departamento Administrativo Nacional de Estadística, 2012a).
Municipality	According to the article 311 of the current Constitution of Colombia (1991) and the law 136/1994: It is the fundamental territorial entity of the State divisions, with political, fiscal and administrative autonomy within the limits indicated by the Constitution and laws. Its objectives are the efficient provision of public services, the promotion of development, local progress and management, the promotion of community participation and the social and cultural improvement of its inhabitants (Departamento Administrativo Nacional de Estadística, 2012a).
Rural area	A layout of dispersed homes and farms without paths or naming of streets, roads, avenues and others. In general, rural areas do not have the same utilities' coverage found in urban areas (Departamento Administrativo Nacional de Estadística, 2012).
Metropolitan area	An administrative entity formed by a set of two or more municipalities around an urban area, which are linked together by either physical boundaries, or economic and social connections (Departamento Administrativo Nacional de Estadística, 2012).

Territorial entities	States, districts, municipalities and indigenous and ethnic territories (Departamento Administrativo Nacional de Estadística, 2012a).
Socio-economic stratum	The classification by stratum classifies people's households according to the physical characteristics of their home, surrounding environment, and location in urban and rural areas. The strata are homogenous within it, but heterogenous in comparison to the others. The classification ranges from stratum 1 (lower) to stratum 6 (higher) (Alzate, 2006).

Colombian population

The Colombian population's projection for 2015 is 48,202,617, (51% male 49% female). Currently, Colombia is considered a nation of mixed races mainly composed of Amerindians, European-descendants and African-descendants (Paredes et al., 2003). This admixture component has been inherited from the Spanish colonization, and the current Colombian ethnic classification still has remembrances with the social classification made by the Spaniards based on races. In Colombia, the ethnic minorities corresponded to individuals who belong to a particular group and share same ancestral roots, cultural customs, territorial organization, and language. Ethnic minorities are recognized in the Colombian constitution of 1991, and have specific rights such as their self-governance, environmental protections of their territories, democratic participation, protection of their cultural diversity, and ownership (individual and communal) and protection of their lands (Herrán Pinzón, 2009).

Due to its ethnic and cultural diversity, the Colombian state has applied diverse approaches in order that all Colombian citizens could enjoy same rights. One of those approaches is the differential approach which has been used in several public policies for ethnic minorities, disabled people, vulnerable people (such as Internally Displaced People -IDPs), and women. The United Nations-Office of the High Commissioner for Human Rights in Colombia defines the differential approach as:

> An approach whose methodology aims to identify the diverse discriminatory mechanisms applied to certain populations groups which are minorities in comparison to hegemonic groups in the country. After identifying the discriminatory mechanisms, the approach creates ways to bring the adequate protection and assistance to individuals from those minority groups, for them to enjoy fundamental rights as citizen in the same way that the hegemonic groups do (Oficina del Alto Comisionado de las Naciones Unidas para los Derechos Humanos, 2014).

Colombian context is unique in Latin America given its political and geographical division, its demography, its internal conflict, and its economic development processes. These factors have determined Colombian medicine and public health development. A description of historical relevant points related to health in Colombia is given below.

History of medicine and health services provision in Colombia: a brief summary

In the post-independence time the medical practice in Colombia was orientated towards an anatomic and clinical view of the patient influenced greatly by French medicine. The clinical practice was more focused on the diagnosis, treatment, and rehabilitation of diseases, than on preventive activities (Yepes-Luján et al., 1990). According to Palacios (2006) by the beginning of the XX century, cities in Colombia shared social and economic aspects with rural areas, so that they shared similar aspects like services offered to people. Doctors in private practices provided health services, but other non-medical professionals (such as healers, chemists, and empirical surgeons) continued to offer diseases treatments too (Casas-Orrego, 2004). Furthermore, hospitals had been inherited from colonial times, and operated under the premise of catholic charity. The first faculty of medicine in Colombia was created by a catholic order during the colonial times (XVIII century) (Universidad del Rosario, 2015), and after the independence in the early XIX century, the first faculty of medicine managed by the state was created (Universidad Nacional de Colombia, 2015). Nonetheless, medical doctors, who trained in Europe, returned to

Colombia looking for jobs. During the first half of the XX century, the internal political confrontations, the conflict, and the influence of international scientific movements, had an impact on hospitals and faculties activities. Those institutions were constantly closed and re-opened, and their assistance and teaching models suffered several changes through the years (Obregon-Torres, 2002). This situation was accentuated by the fact that medical doctors did not have an influential position for making political decisions in health, in spite of the existence of some incipient medical associations.

In the 1950s, a new reform (influenced by the United States) was introduced to change the way of imparting medicine in Colombia, situation that was similar in other Latin American countries (Yepes-Luján et al., 1990). This model created by Abraham Flexner promoted the clinical practice linked to research, in other words, the practice of medicine centred in hospitals and the promotion of basic science research. According to Quevedo and Hernandez (1994) in Latin American countries, this new model was combined with the epidemiological theory of disease's multicausality and the theory of systems. This combination allowed the implementation of health systems, whose services were provided in different levels of care, for preventing and treating disease in individuals and rehabilitating individuals with sequels. In Colombia, the Sistema Nacional de Salud-National Health system (SNS) was created in 1970s aiming to establish a national health system, directed by the state, which provided services in different levels of care. Hospitals and general practices worked as a network for providing health services, and people who had previously been seen by medical doctors represented the population who could access the system. By the decade of the 1980s, nearly 70% of the population was covered by the SNS (Hernández, 2002). During the 1990s, Colombia, as other Latin American countries, adopted the neoliberal model of development which tended to minimize the state actions and allow individuals to make decisions about their social protection (Mejía-Ortega and Franco-Giraldo, 2007). Main changes in Colombian health system, during the 2000s decade, are displayed in figure 11:

Figure 11 Timeline with the different changes in health policies in Colombia

	Before 1990s	1990	1991	1993	1993	1993	2000	2001	2006	2007
Type of law, decree or regulation	Hygiene & Sanitation/ National Health System (SNS)	Law 10- descentralize the state	Colombian Constitution- Economic policies changes	Law 100 - Colombian Social Protection system (SGSSS)	Law 60- Decentralization of health system	Plans of Basic Activities in Public Health (PAB)	Changes in the Solidarity fund (FOSyGA)	Law 715- Resources and competence	SIVIGILA- Colombian Public Health Surveillance System	Law 1122 Colombian Plan of Public Health (PNSP)
Definition or level of application	National level	State & municipal level	National level	National level	State & municipal level	Public health is provided in three levels national, state & municipal	Change the funding for public health provision	Distribution of wealth and oil and mineral profits for public health/ Expertise skills for public health workers	National level	National level

(Author's own, 2015)

The social risk management approach[13] (Jørgensen and Holzmann, 2003) was used to create a new health system in which people should havemore responsibility (care) for their own health, and as a result, the National Social Security & Health System (SGSSS) was created in 1993. The SGSSS stablishes people's access based on their ability to pay[14] or by subsidies assigned by the state. The system is framed in the structural pluralism model (Londoño and Frenk, 1997) for managing the health care services through private agents (insurance companies). These private agents (Empresas Promotoras de Salud-Companies for Promotion of the Health, EPS) offer their services according to a scheme of regulated competition markets. Then, other institutions (Instituciones Prestadoras de Salud- Health Care Providers, IPS) provide the healthcare services to users. In the SGSSS, the state has a supervisory (auditing but not provisory) role.

The SGSSS divides the health care provision into two subsystems: the healthcare insurance-based subsystem and the public health subsystem. In regards to the former, different EPS and IPS manage and provide the healthcare services. Some of the health professionals participating in this subsystem are doctors in medicine (general practitioners and specialists), nurses, microbiologists and clinical epidemiologists. People can access this subsystem through three regimes according to their ability to pay. In the third regime known as 'vinculados' people, who did not accomplish the conditions of either having an income or being selected to access subsidy, could access the system but the State assume their costs. In the SGSSS, the Plan Obligatorio en Salud-Health Care Plan (POS) is a package that contains the health services which people could enjoy. However, people should pay additional costs from other health services that are not included in the POS (Guerrero et al., 2011, Abadia and Oviedo, 2009)

[13] In the healthcare system, the population is classified according to risk factor and is offered a range of certain health services according to that classification. The individual in the society is commited to take care of his health procuring to keep healthy habits. Then, the individual could buy a package of services according to his health needs from a healthcare provider.

[14] According to the economic principles is the ability to pay used for taxation. In a simple definition is the capacity of an individual to pay a tax according to his economic resources.

Public health in Colombia I: the beginning of a social medicine

Colombia shares with other Latin American countries the influence of international and philanthropic organizations (mainly the Rockefeller Foundation) in implementing sanitary programmes (Quevedo et al., 2008, Guzmán and Quevedo, 1999, García and Quevedo, 1998, Eslava, 1998) . However, there had been efforts of trying to organize a sanitary system in the post-independence era even before the first international aid was received.

During the XIX century and the first decades of the 1900s, medical doctors who had trained in Europe looked for jobs in cities[15]. Some of these cities were located near rural areas with relevant economic production, and because of this geographical location doctors working there should attend urban and rural populations afflicted by diseases. Marquez-Valderrama (2010) considered that the beginning of the social medicine in Colombia was based on catholic values of bringing aid to the others. Doctors who shared this type of values tried to bring aid not only to people who could afford the services, but also to poor people. In remote areas of the country the catholic orders brought assistance to the poor and the indigenous groups (Gomez-Lopez, 2010). However, this assistance model based on the catholic values brought some problems related to the institutional responsibility of sick people in the country, and the stigma suffered by people afflicted by diseases (e.g., leprosy related to unclean or corrupted body; syphilis related to promiscuity). In the long term, the state did not centralize the health services and did not reach adequately vulnerable populations. As a result, there was insufficient coverage of health services provision and medical supplies in several cities and rural areas in the country. Moreover, hospices were created in certain areas of the country aiming to give palliative care to the sick, but some of those hospices were located in isolated areas and excluded from society (e.g., 'lazarettos' created for people suffering leprosy were institutions located apart from urban centres in certain areas of the country).

Doctors were confronted with diseases related to people's occupation in areas of economic expansion when agricultural production increased to export goods to Europe and United

[15] Cities were the urban centres that had remained from colonial times.

States. Other diseases affecting the population and requiring attention such as leprosy, syphilis, dysentery, flu among other diseases, that had been affecting people since the colonial times, were neglected by the government (Marquez-Valderrama, 2010). Doctors working in rural areas started to give accounts of people's diseases and deaths according to the available system framed in nosology (classification), etiologic (causes), and geographic aspects of the disease (Estrada-Orrego, 2004). Until this moment, Colombian doctors were working under the miasmatic theory[16] of the disease and they based their observations on it. Moreover, doctors had identified two main pathologies affecting populations working in areas with economic relevance: hookworm disease and fevers. Hookworm disease was a problem that affected people working in areas of coffee production and produced anaemia, fatigue, weakness, and eventually death. Doctors had described that the inadequate sanitary conditions of the coffee farms and the places where workers were settled contributed to the spread of the disease. Although Colombian doctors did not have microscopes, they had identified that other factors such as lack of latrines, sewer systems, and good infrastructure in working places led people to be sick. In addition, workers did not use shoes which represented another factor related to the disease (Estrada-Orrego, 2004, Quevedo et al., 2004). Furthermore, doctors also had been studied, classified, and treated fevers in Colombia since the XIX century. Fevers were classified taxonomicly according to the climate of the zone where there were endemic and the period of time that symptoms were displayed by patients (Marquez-Valderrama, 2010). In addition, fevers were related with geographical areas near the main river of Colombia, Magdalena, and classified in two main groups: those related to malaria and other which were not (Mónica García, 2007). On the one hand, doctors based on the miasmatic theory considered that malaria was spread by the consumption of water, and due to the inadequate conditions of the human settlements and the lack of pipe water, some doctors recommended drinking boiled water to avoid acquiring the disease (Marquez-Valderrama 2010, Mónica-García, 2007, Quevedo *et al.*, 2004). On the other hand, doctors could identified that non-malaria fevers were found in warm areas but far away from forestry zones with collections of

[16] This theory, predominant in the Middle Ages as an explanation of the disease, considered that miasmas (a mixture of vapour and putrid material particles) were found in the air and make people to be sick of infectious diseases.

stagnant water. So, some doctors considered that non-malaria fevers were related to other type of sanitary conditions. Palacios (2006) said that by 1918, only 14% of the buildings in urban areas had piped water, electricity and sanitation. Other cities with maritime and fluvial ports and abundance of water resources did not have piped water network. Therefore, people in these areas used tanks, dwells, and different types of vessels to collect water. Doctors considered relevant to educate the population about diseases, due the sanitary conditions of the country, in order to prevent diseases spreading (Casas-Orrego, 2004).

In 1904, the Colombian doctor Roberto Franco introduced the change in the paradigm of the miasmatic theory to a microbiological cause of disease. Franco had studied medicine in Colombia and France and later on he introduced the microscope to the country. Franco led studies of samples of sick people suspecting hookworm disease, and also created the first Tropical Medicine clinic in Colombia leading studies in that type of diseases. A national campaign for tackling hookworm disease was led by Franco and the Asociación Nacional de Cafeteros (National Coffee producers Association) during that time. It was in this context that the Rockefeller Foundation and its philanthropic program arrived in Colombia, in the second decade of the 1900s, when some coffee producers invited them to the country aiming to receive technical and international support for tackling hookworm disease (García and Quevedo, 1998).

Public health in Colombia II: the Rockefeller foundation and the history of disease control

Colombia as other Latin American countries received aid from the Rockefeller Foundation in the areas of medicine, public health and sanitation. Alongside these philanthropic programmes, the Rockefeller Foundation was also looking for potentially economic investments in the country which were materialized in the establishment of different companies in areas of agricultural production and oil exploitation. Quevedo and Garcia described how the Rockefeller Foundation considered important the introduction of philanthropic programmes to prevent the disease transmission focused on tackling

diseases affecting first the United States and later other countries where the United States had established commercial relationships with. According to Cueto (2002), the Rockefeller Foundation sanitary programmes were centred in eliminating and eradicating infectious diseases, emphasising in the sanitation of ports and in the improvement of sanitary infrastructure. The commercial relationships between Colombia and the United States led to the Colombian government inviting the Rockefeller Foundation to start the research about the existence of yellow fever in Colombia in 1917.

Later on, a yellow fever campaign was also implemented looking for the sanitation of port cities and elimination of the *Aedes aegypti*[17] breeding sites in affected urban areas. The campaign was applied in almost all countries where the Rockefeller Foundation was operating in The Americas that were affected by yellow fever. The campaign aimed to avoid the spreading of the disease in Asia due to the increased commercial maritime trade after the inauguration of the Panama Canal (Cueto, 2002). In spite of diverse controversies between the researchers from the Rockefeller Foundation and local doctors about the transmission cycle of yellow fever[18], the Rockefeller Foundation exclusively implemented Anti-aedes campaign in urban areas and ports. During the following years, the vaccine against yellow fever was developed and used in the same affected areas. Then, the Rockefeller Foundation started to work on the eradication of malaria in South America. This campaign was focused mainly in eliminating malaria vector *Anopheles gambiae* (Quevedo *et al*., 2008). After the Second World War, dengue was spread in the American continent especially in urban centres. So, the efforts of the Rockefeller Foundation were focussed on using insecticides, especially DDT, to eliminate the adult mosquitoes of *Aedes aegypti* and *Anopheles gambiae*. According to William (1994), anti- aegypti larvae methods were used for eliminating immature forms of the vector too.

[17] By this time, it was know that the mosquito *Aedes aegypti* was the vector of yellow fever in port cities and urban areas, but any other places of transmission as well other potential vectors had not been identified.
[18] According to some authors (Quevedo *et al*., 2008, Cueto, 2002, Eslava, 1998), the hypotheses of a potential sylvatic cycle of the transmission, as well as an undiscovered causal microorganism was formulated by local doctors during some years before the Rockefeller Foundation officially adopted them.

The Colombian government centralized the activities led by the Rockefeller Foundation creating a special branch within the Junta Central de Higiene (Central Department of Hygiene)[19] which followed instruction from headquarters located in United States (Yepes-Luján et al., 1990). The Colombian government failed to prioritize other diseases affecting the population and the public health was not centralized. The activities in this area were framed in international collaborative work, economic policies, and commercial trade agreements. After the establishment of the World Health Organization, and the Pan American Health Organization (PAHO), the international policies for tackling diseases such as malaria, yellow fever and dengue, were addressed to accomplish by all the participating states (see chapter four, section one). In Colombia, the Ministry of Health, or its equivalent institution, was responsible of operationalizing those policies. In regards to vector-borne diseases and according to Pacheco-Coral and Martinez-Parra (2013) the Servicio de Erradicación de la Malaria-Malaria Erradication Service (SEM) was established by the Ministry of Health and following the PAHO guidelines, this program aimed to eradicate malaria and implement anti-Aedes campaigns through a continuos surveillance of malaria, and yellow fever vectors, the use of insecticides for vector elimination, the follow-up of sick people, and the prevention of malaria, dengue, and yellow fever among populations living in areas at risk.

Another key component of vector-borne disease control programmes was environmental sanitation, which sought the improvement of basic services such as water supply, sewer, waste disposal, hygiene measures, and environmental protection (World Health Organization, 2015c). Yet, some authors (Quevedo et al., 2004) have considered that this component of environmental sanitation was difficult to achieve across the country,specially in areas where mineral exploitation, agricultural development, and large scale stockbreeding were promoted and where vector-borne diseases were endemic.

[19]The Junta Central de Higiene was the major institution responsible of addressing health policies in Colombia during the first half of the XX century. After several and continued reforms during the last 80 years, this institution currently corresponds to the Ministry of Health.

By 1970s the vector-borne policies shifted from elimination to control given that malaria and dengue vectors were not eliminated from the region of The Americas. In the decade of the 1990s, with the decentralization of the national health system the public health programmes disappeared or changed (Hernández, 2002). For instance, vector-borne disease control programmes shifted from vertical and centralized programmes to decentralized ones (Schmunis and Dias, 2000). Public health programmes were included in the Planes de Acción en Salud Pública (PAB) managed by the states and municipalities. However, some of those programmes related to relevant diseases in global health with compulsory surveillance (World Health Organization, 2005) remained under the responsibility of the Ministry of Health. Likewise, costly public health activities remained under the management of the state which continued providing the funding, and issuing national guidelines to implement public health activities.

Once the decentralization process began the vector-control staff started to work according to the activities included in the PAB. Mainly, these activities referred to actions in prevention of the vector-borne diseases and promotion of good practices for controlling them (Suárez et al., 2004). Indicators of cost-efficiency of those activities were assessed too, and this situation caused that trained vector-control staff were working in activities in which they did not have the expertise for. This type of evaluation based on costs led some municipalities to focus on low-cost activities rather than in the ones needed for tackling public health problems (Pacheco-Coral and Martínez-Parra, 2013). After the introduction of the PAB, some activities did not fit vector-borne disease control programmes. Same authors (Pacheco-Coral and Martínez-Parra, 2013) indicated that for instance, the vector control technicians were not always able to work in teams situation that did not allow to do continuous mosquitoes' surveillance and to apply control strategies in the municipalities (Brochero and Quiñones, 2008).

Public Health in Colombia III: the current public health subsystem

In the public health subsystem, the Health Ministry has the role of enacting regulations and issuing guidelines. At a secondary level, the National Health Institute (INS) has diverse responsibilities such as undertaking public health surveillance and sanitation activities, disease control, and monitoring the guidelines' implementation across the country. The subsequent levels are the state and municipal health secretariats which are in charge of developing the public health programmes with communities. This subsystem is funded by economic profits from mineral and oil exploitation and by a special governmental fund. In general, the majority of the people working on this sub-system have a temporal contract starting at the end of January and ending in December every year.

After the reform in the SGSSS, the actions in public health were fragmented and different institutions provided public health services. The high cost services and the activities with community impact were included in the Collective Plans of Health, and provided by the state and municipal secretariats. The activities for preventing disease and promoting healthy behaviours in individuals were provided by the IPSs of the healthcare insurance base subsystem (Hernández, 2002). It is only until 2007, after the introduction of the National Plan of Public Health (PNSP), that the actions in public health are gathered together under the supervision of the Colombian State. The PNSP included public health problems as national priorities and organized the activities to tackle them which were mostly provided by the state and health secretariats. Nevertheless, this plan used the social risk management approach which orientated the activities to impact individuals rather than communities (Vega-Romero and A, 2008). Currently, the Public Health Ten-Year Plan 2012-2021 (Ministerio de Salud y Protección Social, 2013) includes the Social Determinants of Health framework as parts of its methodological approaches in order to develop activities in public health aiming to impact communities and individuals in an integrated way.

Sistema de Vigilancia en Salud Pública-Colombian Public Health Surveillance System (SIVIGILA)

The Colombian Public Health Surveillance System (SIVIGILA) (Ministerio de la Protección Social, 2006) is a group of procedures, protocols, reporting forms, and analysed data which seek to bring systematic and current information about the most relevant public health problems. The main aim of having this type of information is to achieve social protection in the field of health for Colombian populations. The system is organized in six hierarchical levels which are responsible for collecting, processing, analysing, reporting and communicating the information.

The first level is called Unidad Primaria Generadora de Dato- Primary Collecting Data Unit (UPGD) and corresponds to the health care centres (e.g., hospitals, primary health centres, and general medical practices), clinical laboratories, blood centres, and organ donation centres; also, UPGD is responsible for applying protocols, filling up reporting individual forms, analysing the information, and entering data to the electronic datasets. The second level is the Unidad Notificadora de Dato- Reporting Data Unit (UND) and it is responsible for reviewing the information from the UPGD, analysing and classifying it (according to national protocols), and sending it to the next hierarchical level. The two following levels are the municipal and state health secretariats which have the responsibility of supervising, advising, regulating, and supporting the UPGD and the UND. However, the municipal health secretariat was in charge of confirming probable cases and carrying out an active search of potential cases. The fifth level is the INS which is responsible for collecting all the national data information, reviewing it, analysing it and doing reports for the Ministry of Health. Finally, the sixth level, the Ministry of Health, is in charge of directing the system, defining the policies, regulations, and programmes that are used by the five preceding levels, and to inform about the national health profile to the general population and to international agencies. Both the fifth and sixth levels are responsible for supporting and advising the previous levels.

Final words

The difficulties to link the assistance subsystem with the public health one represent an important failure in the health services provision in Colombia. The promotion of a medicine based on clinical practice centred in hospitals (usually located in urban areas), the difficulties to have an integral and unique health system with national coverage, and changes in political decisions in regards to the health priorities have led, as Hernandez (2000) stated, to "the fragmentation of health services in Colombia" (Hernandez, 2000, p994). This problem is not new as has existed since the post-independence time; for instance, by 1841 there was only one medical doctor per 7,350 inhabitants in Colombia mainly working with people living in cities (Obregon-Torres, 2002). Although the numbers of medical doctors was steadly increasing during the following decades, they were mainly located in cities. Between 1936 and 1938 the central government started to consider having a national program of public assistance. The main idea was to create a ministry or department that could lead the sanitary campaigns in the country, regulate medical education, and train public health workers (health inspectors, health managers, and hygienists). In 1938, the President created the Ministry of Labour, Hygiene and Social Provision. However, subsequent reforms of the ministry and the health system (previously mentioned in this section) did not allow that the assistance and public health subsystems worked together. Then, some medical doctors who were working in areas of economic development, in association with entrepreneurs, and some governmental institutions conceived the idea of establishing a rural health service. This service started with the figure of rural doctors who had specific areas under their responsibility. In 1957 the figure of rural health promoters was created in certain municipalities. These promoters were women from the communities trained in basic health knowledge (prevention of diseases and promotion of healthy practices) who visited community peers in their houses. Both rural doctors and health promoters' initiative was officially adopted by the central government in 1965 (Yepes-Luján et al., 1990). However, ten years later after the adoption of this initiative only 9.2% of medical doctors and 13.2% of nurses were working in rural areas (Giraldo-Samper, 1976). At the beginning of the XXI century, there was 1.25 medical

doctors per 1,000 inhabitants concentrated in the regions with more economic development in Colombia (Ruiz et al., 2008).

In this section, Colombia's main features and a brief summary of its history of medicine and public health were described. Colombia is a multi-ethnic country, rich in multiples cultures and biodiversity, as well as in other resources. However during the last fifty years, Colombia has faced problems related to conflict and its consequences. In the next section the topic of migration is addressed, aiming to have a background in which will be possible to understand partly Colombia's conflict situation and other social aspects related to migration.

Chapter 2, Section 3: Migration processes

In this section, migration and related terms are defined, and a summary of the internal migration processes in Colombia is presented. Then, the definition of forced migration, and the description of conflict in Colombia and Internal Displacement as a consequence of conflict are explained. Migration and urbanization relationship is also addressed in this section. Finally, other topics, such as health of migrants, and social networking and emporwement around health are described.

Definitions

In order to clarify some terminology used in this section and in the thesis document, some definitions are summarized in table 4:

Table 4 Definitions of migration's terminology

Term	Definitions
Migration	According to Elizaga (1979): Defined as a complex process propitiated by the psychological, sociological and economic aspects of any individual to lead him moving from one place to another; this process is also influenced by the individual's educational status, current norms and social structure where the individual is embedded, and the relationship between material needs and availability of natural resources and technologies (Elizaga, 1979).
Internal migration	Internal migration is also defined as "population movements which demand a permanent change of either place of residence or community" (Elizaga, 1979, p217) and is restricted to the borders of a country. For statistical and demographic purposes,

	this definition should also consider time and space in which the migration takes place.
Migrants	According to International Organization for Migration, IOM (2006): At the international level, no universally accepted definition of migrant exists. The term migrant is usually understood to cover all cases where the decision to migrate is taken freely by the individual concerned for reasons of 'personal convenience' and without intervention of an external compelling factor. This term therefore applies to persons, and family members, moving to another country or region to improve their material or social conditions for themselves or their family (Organización Internacional para las Migraciones, 2006).
Forced migration	For Petersen (1958), in forced migration, people move without deciding whether they are willing to leave. According to Ruíz-Ruíz (2006) forced migration is a violent population movement, affecting massive amounts of people, usually following social restructuring processes (e.g., land or wealth re-distribution). In general, it is possible to identify two types of forced migrants: refugees and IDPs.
Internal Displacement	According to International Organization for Migration, IOM (2006): A forced removal of a person from his home, often due to of armed conflict or natural disasters, within the borders of his nation (Organización Internacional para las Migraciones, 2006)
Refugee	According to the United Nations High Commissioner

	for Refugees, UNHCR (2000): A person who, owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country (United Nations High Commissioner for Refugees, 2000).
Internal Displaced Person/People (IDPs)	According to the Colombian law 387/1997: An IDP is one who has been forced to flee within the nation leaving his place of residence or his habitual labour activities; because of his life, physical integrity, safety, or freedom have been threatened by armed conflict, internal strife, riots, generalized violence, massive violations to the Human Rights, or any violent activity derived from the previous ones (Congreso de Colombia, 1997a). Also, according to Colombian law 1448/2011 (Ministerio del Interior y de Justicia, 2011), this category also considers as victims of Internal Displacement the spouses, the same-sex partners, and the first degree of blood relatives of IDPs. In case the mentioned people were killed, the second degree of blood relatives would be included in this category.

Internal Migration in Colombia

According to Granados-Jimenez (2010), the internal migration in Colombia has been mainly studied since the perspective of economic theories[20] specially those related to the

[20] Economic theories such as the push-pull (expulsion and attraction factors) and the economic migration to developed regions.

development process. However, this perspective does not explain exclusively either the causes that migrants have had, or the pattern of movement that they have followed. Since the social sciences, there are other perspectives[21] which could be used to frame the pattern of Colombian internal migration.

Granados-Jimenez considered four categories to classify the patterns of internal migration in Colombia: 1) the migration linked to enclave zones, in special, zones for mining and oil exploitation and other agricultural activities for exportation purposes; 2) the migration linked to natural disasters and infraestructural development programmes; 3) the migration linked to processes of colonization and recolonization of rural, remote, and inhabitated areas; and 4) the forced migration (mainly due to conflict). I refer to the last category henceforth because that is the main cause of Internal Displacement in Colombia.

Forced migration

According to Muggah (2000), forced migration has four recognized causes "natural disasters (e.g. drought); persecution (e.g. ethnic or religious); development programmes (e.g. dams and urban renewal projects); and violent conflict" (Muggah, 2000, p1). Especially for the latest category, the term conflict-induced displacement is used to emphasize people's mobilization due to violence.

The types of conflict more prevalent, during the modern era, are mainly two: 1) the intra-states conflict and 2) the asymmetric wars between states and militias across and beyond borders. Several factors need to be considered as possible drivers of conflict[22]; however, poverty, disparities, and exploitation of natural resources are creating a niche for conflicts worldwide. Moreover, the most important consequences of conflict are the negative effects

[21] Perspectives such as process of colonization and re-colonization have been widely studied in Colombia, but they are not going to be explained in this document.

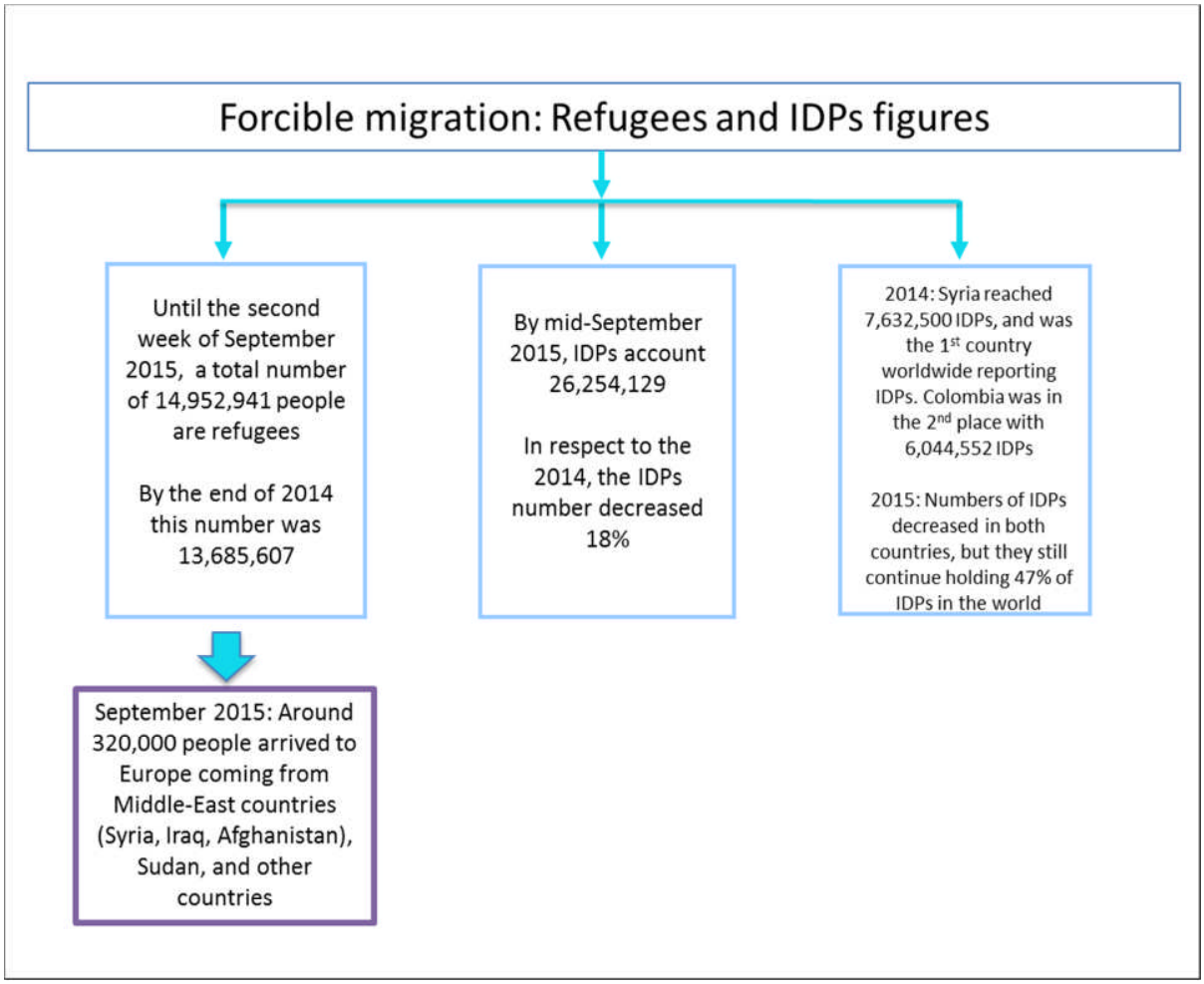
[22] Conflict might have other causes and even other factors that could change or influence it, but those factors are not discussed in this document. This dissertation tries to focus on the concept of Internal Displacement as a consequence of conflict, because currently Colombia is facing the conflict's consequences. Colombia is also entering in a phase that is known as the post-conflict era which might require research about the conflict consequences and their potential solutions.

on people's social and economic conditions, health, and wellbeing (Kett, 2005). In addition, Gibney (2014) considered that forced migration is important because it questions the sovereignty and citizenship's integrity of affected states. The same author citing (Arendt, 1986) posits that citizens affected by forced migration face a statelessness situation; in other words citizens forcibly displaced "suffer a loss of their very right to have rights" in their own state. Moreover, citizens in this situation "lost their citizenship becoming completely subjects of the state"; as a consequence forced migrants become totally "dependants of the state even in democratic societies" (Arendt, 1986, p296).

Therefore, states affected by forced migration should not only guarantee forced migrants their social protection, but also offer the necessary mechanisms for them to recover their citizenship rights. To this extent, the UNHCR (2011), highlights the increasing amount of new forcibly displaced people worldwide during recent years (See Figure 15). For Jacobsen (2014), the global concern about this type of migrants is related to their livelihood which is vastly different to the livelihoods of other migrants or poor people. The same author stated that there are three main differences in the livelihoods of forced migrants; first, forced migrants are in a "state of loss" because of their lack of "assets, family, community, emotional, and physical health" (Jacobsen, 2014, p99). Second, forced migrants are embedded in the specific social, political and legal context of host places which usually is not a friendly context for them. Third, forced migrants frequently receive humanitarian aid and assistance which could have negative effects on them in the long term because creates mechanisms of dependence between the aider and the victims of forcible migration. Jacobsen (2014) also mentioned that many of the global efforts pursue the 'sustainable livelihoods' of forced migrants in order for them to integrate with the new context and build social cohesion with host communities. However, for this author the ultimate goal of these global efforts should be for forced migrants to access their 'livelihoods assets'; in order for them not to suffer exclusion, not to face impoverishment, not to have a deterioration of their wellbeing, and not to be dependent on the state.

According to UNHCR (2015), the year 2014 closed with a total of 55 million people who suffered forcible migration (See Figure 12).

Figure 12 Forced migration's figures



Author's own with data collected from (United Nations High Commissioner for Refugees, 2015)

Colombian violence and Internal Displacement

Aiming to give a description of Colombian conflict and its consequences, firstly, the main features of Colombian violence from the second half of XX century are summarized. Secondly, one of the most visible outcomes of this period of Colombian violence, the Internal Displacement, is explored.

To bear in mind

Colombia has suffered cycles of violence perpetuated partly because many people who were victims of violence wanted revenge; the worst outcomes of these cycles are that many people accept violent means (legal or illegal) in order to control violence. In recent decades the government has legitimized armed interventions to fight illegal armed groups; the war against those groups has brought not only physical consequences like death, injuries, and disability, but also non-physical consequences such as people's exodus and social devastation. In order to contextualize the facts which occurred around 1950, it should be said that before that year there had existed enough conditions such as the unequal distribution of wealth between social classes, the economic disparities among different regions in the country, the neglected investment in rural areas, the predominant consociational[23] democracy, and the continuous armed confrontations between political parties which together had led to a civil war in the XIX century and nurtured the conflict's atmosphere in the XX century.

Colombian violence from mid-XX century until today

By 1947, the populist and liberal leader Jorge Eliecer Gaitan had reached the peak of popularity among low social classes and peasants, and everything indicated that he would be elected as a president. However, the majority of political elites and high social classes in the country were against his ideas, and different circumstances and conspiracies led to his assassination in 1948 (Palacios, 2012). Gaitan death represented the trigger of one of the most violent events in Colombia known as 'La Violencia', and it seems that this event also marked the beginning of the recent armed conflict in Colombia (Bello, 2004). 'La Violencia' happened in the half of the XX century affecting almost all regions across the country, and currently there are still no agreements about when it finished (Palacios, 2012, Bello 2004). Basically, this event was an urban and rural conflict between people from conservative and

[23] Term explained elsewhere in this chapter.

liberal parties involving several armed confrontations, persecutions, deaths and people's exodus within and outside the country (Palacios, 2012).

According to Palacios (2012), after this event it is possible to distinguish different periods of conflict and ceasefire, and also to relate these periods with the political situation of Colombia, and the consolidation of illegal armed groups. In this segment, I follow Palacios periods, summarize their main characteristics, relate them with land distribution in Colombia, and make a reference to affected social classes.

Palacios considered that during 1949-1953 took place 'the first wave of violence' in which communist and liberal guerrillas were against the state. He also mentioned that this period is characterized by the failure of the populist movement and the beginning of the only dictatorship which has existed in Colombia. Then 'the first ceasefire' occurred between 1953 and 1954 in which the dictatorship was established and there were agreements for liberal guerrillas to demobilize. According to Dix (1980), during these years there was peace in the country but it did not last because of the dictator Rojas-Pinilla's desires of remaining in power. Therefore, 'the second wave of violence' started in 1954 and it lasted until 1957 when the dictator was overthrown by a coalition of liberal and conservative parties, business sectors, and army members. Moreover, there were some liberal gangs and communist guerrillas fighting against the state. In this context, in 1958 the 'second ceasefire' period began, lasting four years more, and it was characterized by an agreement (known as Frente Nacional) between the liberal and conservative parties in which they committed to alternate the government every electoral period; this way of sharing the power among parties is known as consociationalism and is used in order to conciliate deep fragmentations within a state avoiding violence (Dix, 1980). As a result of this agreement, the last liberal gangs were dismantled but there were still problems with some communist groups; during this period it there was also declared a state of siege which was kept until the decade of the 1980s.

This environment was favourable for the growth of rural guerrillas between 1960 and 1989; Palacio called this period 'marginal guerrilla war' because the armed response

against them was mainly in rural areas or towns. Although Colombian guerrilla groups are very different in their philosophical, sociological and political posture, almost all of them have considered it legitimate both to fight against the state, and to have under their control large amounts of productive lands. For Machado (2004), the growth and strengthening of rural guerrillas have their foundations in the existence of two political problems in Colombia: 1) the delay in enacting an agricultural law reform expected since the end of the Spanish colony, and 2) the unfair distribution of the rural lands' tenancy among poor peasants (Machado, 2004). Regarding the first problem, the absence of an agricultural law reform, which protects both land tenancy titles and profits for poor peasants, has contributed partly to the impoverishment of rural areas and the emergence of violence as a response. With regards to the second problem, the unequal distribution of land tenure among poor peasants has been one of the drivers of violent contestations against the state (Cárdenas, 2000, Echeverry et al., 2000).

Table 5 summarizes the proportion of landowners according to the land size's division made by the government. Near 70% of poor peasants were concentrated in very small amounts of lands. In spite of the existence of the state of siege, rural guerrillas achieved to have the control of large rural areas in the country; as a result, paramilitary groups were legally created in 1965 and 1968 aiming for them to fight guerrillas, and they were considered legal armed groups until 1989 (Palacios, 2012). Added to this the Colombian Army was reinforced by the government in order to combat illegal groups, thus the conflict in rural areas started to be more complex (Giraldo et al., 2009, Dávila et al., 2006). In this state of conflagration, around the 1970s some criminals saw the opportunities to cultivate drugs in parallel to the cultivation of agricultural products. During this decade, the Colombian economy was based on mineral exploitation, and the exportation of agricultural products such as coffee, rubber, and tobacco, because of the failure in developing a strong industrial sector in the cities. So, rich landowners in partnership with politicians promoted inter-regional migration waves aiming for poor peasants to cultivate the rural and forestry areas where these agricultural products could grow. Thus, conflict and migration represented an opportunity for criminals to cultivate illegal drugs in the same areas where agriculture was promoted.

Table -5 Land distribution variation across time in Colombia

Year	1964	1984	2000	2009
Land size	Owners of the land (%)	Owners of the land (%)	Owners of the land (%)	Owners of the land (%)
Micro (<3 hectares)	55.1	55	57.3	55.1
Small-holdings (>3 <10hectares)	23.7	22	21	20.6
Small (>10 <20hectares)	8.2	8.3	8.0	8.0
Medium (>20 <200 hectares)	11.4	13.2	12.4	12.3
Big (>200 <2000 hectares)	2.5	1.5	1.3	1.4

Author's own elaborated with data collected from (Kalmanovitz and López, 2006, Palacios, 2012)

The last period considered by Palacios (2012) started in 1985 and continues until our days; he called this period of conflict 'dirty war of low intensity' because of the involvement of several actors (illegal and legal), the use of war strategies against human rights, the involvement and attack of civilians, and the extension of the conflict across rural and urban areas. At the same time, drug trafficking increased and several drug trafficking networks were created; also, guerrillas and paramilitary groups saw the opportunity to have profits from illegal drug production. Meanwhile, the Frente National agreement ended leading to an electoral crisis in the country, which was followed by the establishment of diverse political parties. The political division atmosphere, and the profits from drug trafficking gave drug barons and paramilitary leaders the opportunities both to fund their own candidates for elections, and to influence the political decisions in the country (Palacios, 2012).

The unfair distribution of land continued during this period; from 1985 to 1996 the majority of cultivable big lands were used as monocultures. On the other hand, small lands

were used to produce a variety of crops. Rich landowners and peasants could only buy and sell their land to people of the same social class. Thus, even the market among peasants was wider than the one for rich landowners; it was a market composed of poor owners with scarce possibilities of improving their social and economic conditions (Machado, 2004). The concentration of large extensions of land by a few landowners contributed to the impoverishment of peasants who had lived from agriculture; this situation represented another expelling factor of people from rural to urban areas. As a consequence, strangers took the abandoned lands in rural areas and eventually acquired those lands either by force or through legal titles.

So, during this period the rise of guerrilla groups was in parallel to the rise of rural poverty; also, factors such as lack of income, social protection, and safety among poor peasants nurtured the popularity and strength of those groups in rural areas. Additionally, since the 1980s armed groups started to have illegal rural lands used for drug production and trafficking purposes (Kalmanovitz and López, 2006, Bello, 2004). On the one hand, guerrilla groups opted to control several rural areas, perpetuating unfair land distribution and promoting drug production (Nussio and Howe, 2012); on the other hand, in 1989 paramilitary groups began to be involved in drug-trafficking activities too (Palacios, 2012). It should be noted that only one guerrilla accepted the amnesty offered by the government in this period, the M-19 ('Movimiento 19 de Abril'); once M-19 members were demobilized, the former leaders participated with other societal sectors in the creation of the National Constitution of 1991. In spite of these, other guerrillas groups continued fighting the state, and the number of guerrilla groups increased gradually from 14 in 1980 to 102 in 2007.

During the 1990s, continuous Colombian Army actions against guerrillas exacerbated the armed conflict. Nevertheless, guerrilla groups were not weakened; on the contrary, they increased their military power and expanded their territorial boundaries through forced displacement and expropriation of the rural land. Between 1995 and 1998 Colombia coca acreage grew from 45,000 to 105,000 hectares, mostly in the Orinoco and Amazon regions (Drug Enforcement Agency, 2000). In spite of the increase and strength of anti-narcotics actions, supported by international agreements and funding, the established drug

trafficking networks continued working. When many drug barons were captured or killed, the paramilitary groups inherited lands from drug traffickers and used it for the cultivation of drugs. As a result, in 1999 it was estimated that 1.4% of the national GDP came from profits derived from illicit cultivation and exportation of drugs (Moron and Pacheco, 2007).

Additionally, by the end of the 1990s several factors have a negative impact in the development of the agriculture sector in Colombia such as the diverse changes in global economy, the introduction of neoliberalism in Colombia, and the establishment of taxes for protecting industry and monocultures. Moreover, during that decade the government had also promoted the extensive production of crops that could be exported like coffee, banana, oil palm, and flowers, and which market was regulated by the international demand and the competition with other countries' production (Kalmanovitz and López, 2003). However, the government did not stimulate or protect the smallholdings (lands of three or less hectares), owned by poor peasants, which made their economic situation worse. By 1995, the smallholdings represented only 15.6% of Colombian rural land but their owners were 82.4% of Colombian peasants. In 1996 the national Gini index[24] for concentration of the rural land was 88%, but the average Gini Index, for concentration of the rural, land in all agricultural productive regions was 82.6%. So that, in 1950 23.3% of Colombian land had been used for non-permanent cultures (for national and local consumption) and 24.5% for permanent cultures (for exportation), but by 2000 these percentages shifted to 18% and 35.9% respectively (Kalmanovitz and López, 2006).

During the period 1996-2002, Colombia had two presidents (one from liberal party and one from conservative party) which failed in the attempts to reconcile peace with guerrillas. Moreover, the war against drugs was strengthened specially through military

[24] According to the World Bank, 'the Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality' BANK, W. 2015a. *GINI index (World Bank estimate)* [Online]. Available: http://data.worldbank.org/indicator/SI.POV.GINI.

actions to combat drug dealers and illegal groups (guerrillas and paramilitary groups) related to drug trafficking (Palacios, 2012). Therefore, the conflict worsens as well as its consequences. This situation led people to elect in 2002, the new President Alvaro Uribe who represented a third party and was re-elected in 2006 (Gonzalez Gonzalez, 2014). During Uribe's 8-years Presidential period, the demobilization of paramilitary groups was achieved[25] through a legal mechanism known as transitional justice which allow the diverse sectors of the society (citizens, communities, government, and illegal groups) to start processes of peace agreements. In these processes is expected that people who have involved in the conflict as perpetrators or victims could establish a dialogue in fair legal trials, the perpetrators could be judged and sentenced, and all the direct victims or perpetrators could be reintegrated to the society at certain point of the processes (Ministerio del Interior y de Justicia, 2011). On the other hand, the peace agreements with guerrillas were not achieved and the military actions against them continued. Then, in 2010 a new President, Juan Manuel Santos, was elected and re-elected in 2014. Although, during the first years of his government Santos continued with the military actions, in 2011 he started an official peace agreement process with the FARC (Fuerzas Armadas Revolucionarias de Colombia) the largest guerrilla group in Colombia. This process has been extended during 3 years with positive and negative results for the country, but it still does not achieve the demobilization of the members of the FARC (Gonzalez Gonzalez, 2014).

To sum up, long-term conflict in Colombia has had many effects in the country some which might be positive in terms of fair application of justice and periods of amnesty. Nonetheless, many of the effects of this conflict have been negative and affected many population groups in Colombia. In this document, it is addressed one of these negative effects in populations affected by Internal Displacement. IDPs in Colombia are victims of the conflict, but also of the stigma and of the society who neglected them during many years (Médicos Sin Fronteras, 2010, Bello, 2004).

[25] It seems that not all the cells belonging to paramilitary groups were demobilized during this time, however, this topic is not discussed in this document.

Internal Displacement in Colombia

Colombia has the second greatest number of IDPs in the world (United Nations High Commissioner for Refugees, 2015) and, according to Bello (2004), Internal Displacement has been perpetuated since the event of `la Violencia'; however, it was only legally recognized by the government in 1997. Gomez-Jimenez (2006) stated that Internal Displacement increased from 89,000 in 1985 to 400,000 by 2000. CODHES (Consultoría para los Derechos Humanos y el Desplazamiento, 2011a) found that in Colombia there was an upward tendency of new forced displaced people starting in 2000 with 300,000, peaked in 450,000 by 2002, and drop to 200,000 in 2003. Bello (2004) considered that this situation was provoked by the conflagration among illegal groups and national army forces, and its causes are related to control of geographical areas. According to CODHES during 2003 and 2006 the trend of new forced displacement in Colombia oscillated between 200,000 and 300,000per year. Although these numbers are bigger than the ones reported by the government, both information systems registered less new displacement events in comparison with the previous years.

I consider that this tendency could be explained by three reasons; first, since 2002 the government had promoted the process of demobilisation of paramilitary groups which prevented many violent events. Second, in 2004 the Colombian Supreme Court declared the 'unconstitutional state of affairs' which recognized displaced populations as victims of human rights violations and established their compulsory register. Third, during this period of time the government implemented the returning process for displaced people to recover their lands and to settle again in the countryside. Amnesty International (2009) highlights that for the period 2006-2010, 3 to 4 million people had been displaced from their homes. IDPs usually move from the rural area to the nearby small city. People have been forced to leave behind their towns, properties, lands and money, escaping the threats of armed groups (Amnesty International, 2009). Whether IDP can find a safety network in the small city to avoid the threats that forced them to move, they remain there or try to return. In case IDPs do not find a safe environment, they continue moving to the closest medium-size or main cities (Bello, 2004).

Since 1997, any IDP who wanted to be protected by Colombian law must demonstrate that he has been expelled from his own land, persecuted by armed groups, and affected by the conflict. Once the IDP proves these conditions, the government legalizes his IDP status and allows him to enjoy protection, healthcare, education, financial aid, housing, legal restitution of his land and safe returning. Social mobilization and legal adjustments allow that IDPs could receive emergent aid (not only related to healthcare services, but legal advice, protection and security), and a more fair process for legalizing the IDP status (Ministerio del Interior y de Justicia, 2011). In 2013, Santos' government recognized IDPs accounts which were underestimated by several years (Centro Nacional de Memoria Histórica, 2013). Although this recognition represented a step towards the acknowledgement of the problem of Internal Displacement in the country, there were still consequences from the underestimation of IDPs numbers. Two of these consequences were, firstly, the country either considered IDPs as internal (voluntary) migrants, which is explained below, or as permanent residents of host areas (Departamento Administrativo Nacional de Estadística, 2008). This situation might have an effect in the demographic data of host areas, and also in the relationship between migration and urbanization in the country. Secondly, the country could not manage adequately the healthcare provision for IDPs and respond to their health needs as mobile populations. The relevance of the relationship between migration and health is explained elsewhere in this section, as well as the implications of migration for public health.

Migration and urbanization

Eliazaga (1979) considered that from the demographic point of view, urbanization is the most visible outcome of internal migration (voluntary of forced) processes, because urbanization reflects both the people's patterns of rural to urban movements and their impact on shaping cities. In general, disorganized urban patterns are worst when there are waves of forcibly displaced migrants.

The second UCL-Lancet Commission stated that (Rydin et al., 2012) 3.4 billion people live in urban areas and this number might double by 2050. Moreover, Giraldo *et al* (2009) stated that by 2030 the worldwide rural population will be reduced by 28 million people. Some authors have considered that cities might offer new economic opportunities to rural migrants (Alirol et al., 2011); however, this does not necessarily mean that large or mega-cities will increase in size but that medium-sized cities will emerge. It is possible that both planned and unplanned processes will mediate medium-sized cities spreading, so it is expected that the population living in slum-like conditions will increase from 1 to 2 billion by 2030 (Rydin et al., 2012). The growth of medium-sized cities because of rural migration has several implications for migrants to adapt to new conditions and to be integrated with other people within the cities. Usually, rural migrants located in peri-urban areas preserve many of their rural habits and also face a lack of urban services and social networks, which lead them to have different livelihoods in comparison to urban populations. Therefore, as Allen (2003) explained a peri-urban area constitutes a new space which is neither urban nor rural within cities:

> An 'uneasy' phenomenon, usually characterized by either the loss of 'rural' aspects (loss of fertile soil, agricultural land, natural landscape, etc.) or the lack of 'urban' attributes (low density, lack of accessibility, lack of services and infrastructure, etc.). Attempts to conceptualize this new development landscape range from the emphasis on rural–urban linkages as footloose processes rapidly transforming territories, to the notion of the 'peri-urban' as a term qualifying areas with mixed rural and urban features (Allen, 2003, p136).

As a result of this new configuration of peri-urban areas, rural-urban migrants might not share common features with other urban populations, even with urban poor ones, because of the cultural differences between migrants and urban populations. It is also possible that when rural migrants arrive in cities they will use their own cultural background, thoughts, beliefs and knowledge to build their new lifestyle within cities. Brook and Davila (Brook and Dávila, 2000) pointed how these cultural differences have in impact in migrants' behaviour and relationship with peri-urban areas (See Figure 13):

Figure 13 Peri-urban interface

Peri-urban interface and people's interaction with that space according to Brook and Davila (2000)
• Usually people either cannot take advantage of the opportunities presented by urban markets include the already land poor, or have insufficient capital to purchase land and/or intensify production. Often, women find it more difficult than men to access all these resources
• Urban pressures on common pool resources such as forests, rivers and wetlands, may lead to environmental degradation and reduced access by the poor to products they were previously able to gather
• Residents in villages within the zone of peri-urban influence are presented with alternative economic opportunities in the expanding urban economy. This might result from agricultural intensification, demand for raw materials, wage employment in urban enterprises or opportunities for self-employment
• There is very little information available on processes of social change in peri-urban villages
• There is likely to be increasing competition for resources (such as water, building materials, energy) between local communities within the peri-urban area and the city. Analyses of the relative access to infrastructure of rich and poor households are scarce

(Brook and Davila, 2000, p168)

Kendall *et al* (1991) stated the inadequate social conditions facilitate the spread of diseases related to sanitation and water (use and disposal), vector transmission, pollution, and violence. Therefore, adequate housing for people does not only refer to a place to live, but to the environment that surrounds that place. UN-Habitat (2009) characterized adequate housing as:

> Adequate housing must offer a healthy environment in relation to the characteristics of their infrastructure, their space and their equipment, including the provision of domiciliary public services, legal tenure security, a next healthy

environment with convenient access to social services (hospitals, schools, leisure infrastructure, government offices and companies), and a good connection to the other physical elements and, in common terms, we can denote as neighbourhood (Giraldo *et al,* 2009, p115-116).

Urbanization and migration: Colombian case

In regards to the Colombian urban areas, there is still substantial unplanned urbanisation and inadequate housing. Besides, Colombian high rates of rural-urban migration have led some populations to live in informal settlements in peri-urban areas since 1950. Thus, many of those settlements have been built in this way throughout the country. Ramirez-Galindo stated that 40% of Colombian poor people live in cities and 20% of them live in informal settlements (Ramirez-Galindo, 2012). Moreover, Colombian internal migration is characterized by multiple rural to urban migration[26] waves which have also fitted in the development pattern of the country. Main features of the urbanization pattern and their concordances with the National Development Plans are summarized below.

During 1960-1980, there was promoted the growth of some cities which could lead the development in regions (where those cities were located) aiming not to invest all the economic resources in the main cities. Urban areas changed accordingly to the economic conditions, and their societal composition according to people's occupation. For instance, in the decade of the 1960s the majority of the middle class had been composed by people dedicate to commerce, middling landowners, and entrepreuners. The lower class was composed by artisans, merchants, and small farmers (Palacios, 2006). By 1973 the more productive regions concentrated nearly 60% of the Colombian population only in the main cities (Departamento Administrativo Nacional de Estadística, 2000). By the end of the decade of 1980 the industry sector was grew more than the agricultural one. In 1985, the urban population represented 65% of Colombians, and more than half of industrial

[26] Urban-urban migration pattern is important in internal migration as well as in Internal Displacement in Colombia, however, these topic is not described in this document.

workers were living in the main cities. Nevertheless, the informal sector (conformed by people who worked as independent sellers, houseworkers (cleaners), and artisans) was also relevant in main cities. Later on, in 2005 the urban population had increased up to 75% and the services sector was the main economic activity in which people work (Palacios, 2006, Giraldo et al., 2009).

According to Ramirez-Rios (2011), the National Development Plan of 1969-1972 sought to keep a balance in the migration pattern in the country, to promote migration towards all types of cities, and to connect small and medium-size cities with main ones. Palacios (2006) mentioned that Colombia developed regional networks connecting cities without including rural areas; in other words, during this period Colombian development prioritized the growth of the main and medium-sizes cities and neglected the development of small cities and rural areas. Giraldo *et al* (2009) stated that as a result of this phenomenon some medium-size cities grew almost in parallel as Bogotá (the capital city); also, main cities growth was facilitated partly by adding to them the nearest rural areas (Giraldo et al., 2009).

During the period 1970-1974, the National Development Plan included two of the recommendations of the International Bank for Reconstruction and Development report led by Lauchlin Currie (Palacios, 2006, Escobar, 1988). The first recommendation was to tax the land ownership aiming to push the rich landowners to either use the land for agricultural purposes or sell it, and the second recommendation was to create policies which promoted rural to urban migration in order to expand the industrial sector. Additionally, the country was divided in regions according to their economic relevance, and the main cities were capitals of the most productive states within those regions (Kalmanovitz and López, 2003, Palacios, 2006, Kalmanovitz and López, 2006, Giraldo et al., 2009, Departamento Nacional de Planeación, 2012). Between 1988 and 1993, an average of 460,000 people internally migrated per year in order to find jobs in growing cities; thus, the major concentrations of people coincided with the growth of main and medium-size cities (Departamento Administrativo Nacional de Estadística, 2000). The differences between the socio-economic conditions in cities and rural areas, in addition to a change in

demographical patterns (e.g., changes in birth and maternal mortality rates, and demographic transition) of urban areas, eventually led to a growth in the size of main and medium-size cities in Colombia (Giraldo et al., 2009). During the decade of the 1990s, main cities passed to a process of metropolization including nearby small urban and rural areas. Therefore, the main cities started to add the new areas in their outher rings. Also, medium-size cities hosted people who no longer lived in the countryside (Giraldo *et al*., 2009). Some of the migrants arriving in urban areas were located in illegal setlements, hostels, and slum-like settlements (Giraldo-Samper, 1976). According to the 1993 census more than 70% of the Colombian population was urban rather than rural and the internal migration rate was 15.2/10,000 inhabitants; this phenomena has at least three possible explanations. First, as some authors (Giraldo et al., 2009, Palacios, 2006) have stated, the rise of urban population followed the political changes in the state around the 1990s[27], and that is why a great influx of migrants were looking for a job in cities. Second, other authors stated that by the 1990s internal migration was partly explained by some forced migration of people from rural to urban areas; also, the Consultoría para los Derechos Humanos y el Desplazamiento (CODHES) (2011a) registered at least 100,000 forcibly displaced people between 1985 and 1997. Third, some other authors (Giraldo et al., 2009, Ruíz-Ruíz, 2008) have considered that Colombian censuses have not used an appropriate methodology; therefore, they have underestimated population counts especially of people living in rural areas. Since the 2000, the guidelines for the organization of territory, land use, and urban planning in Colombia are contained in the Plan de Organización Territorial (POT) (Congreso de Colombia, 1997b). However, after the POT's launch there were still problems for having planned urbanization in the country mainly because of two reasons; 1) the continuation of rural to urban migration and 2) the scarcity in housing offer for migrants and the urban-poor populations. Between 1989 and 1998, social housing offer and the use of urban land for housing were not priorities in the National Development Plans because most efforts and goals were focused on tackling drugs trafficking and violence; social housing also suffered a negative impact when Colombia adopted a neoliberal economic model in the 1990s.

[27] Introduction of neoliberal economic policies.

Given that the government had expected that people would find a job in the labour market and could afford their own house, as a result of the implementation of the economic model changes, it introduced a subsidy for the demand for housing (credits for helping builders) rather than to the offer (credits for helping buyers). However, the expected changes in the labour market never materialised, and many people remained unemployed and could not buy a house. In 1991 the law 3 (Congreso de Colombia, 1991) was enacted which established the System of Social Housing for poor people and formalized subsidies for buyers; however, neither the introduction of subsidies for housing, nor the creation of new reforms to the labour laws helped buyers to possess their own house. By 2003 there was estimated a national deficit of 2.3 million of houses, 30% of the households were affected by some housing need, and 1.35 million of households were located in precarious settlements (Departamento Nacional de Planeación et al., 2005). In 2005, diverse Colombian sectors debated the housing situation, following the guidelines of housing addressed the Millennium Development Goals (MDGs), and addressed the classification of housing as adequate or inadequate (from the National Development Plan 1994-1998) and considered this classification an important part of the urbanization planning (Dávila et al., 2006). In spite of all these efforts, by 2005 64.9% of the housing offers remained as informal and 35.1% as formal; just half of formal housing was offered to social housing, and only 4.7% of this fraction was offered to the poorest and vulnerable population (Ramirez-Galindo, 2012).

The provision of utility services in Colombia: a brief insight in the provision of pipe water and governance

According to Moncada-Mesa *et al* (2013), at the end of the XIX century the provision of water pipe service in the country was under the responsibility of entrepreneurs and individuals who wanted to implement sanitary infrastructure. In the first three decades of the 1900s, the State started to assume the responsibility of the provision of piped water services through municipal governments. Between 1950 and 1990, the Colombian state regulated, funded, and provided the water pipe service in the country; however, by 1986 only 63% of the country had coverage of pipe water network.

In urban centres, the problem of informal settlements pointed out the need of pipe water's coverage among population living in those areas. Given that some of the irregular settlements started as being illegal, the Colombian state tried to tackle this practice through the prosecution of illegal sellers. However, the state also legalized this type of settlements through entitling the ownership to people living there, improving communication networks, and offering services to communities (Palacios, 2006). In addition, there have been communities' initiatives for providing piped water in places where the government did not reach the coverage (mainly rural areas). These initiatives have been embedded in participative exercises among communities, governmental institutions, and other societal sectors (Moncada-Mesa *et al*., 2013).

In 1994, law 142 (Congreso de Colombia, 1994) considered water as an economic good that could be offered as a service by providers and demanded by the public within a regulated market. According to this law, three different types of companies could provide the water service: private, public[28], and mixed[29] ones. According to Moncada-Mesa *et al* (2013), the mixed companies (category that include communities' initiatives) do not have enough support from the government because these types of companies do not have the same principles, as private companies, for participating in the logic of the liberalization of markets[30]. However, these authors (Moncada-Mesa *et al*., 2013) have considered that these types of companies could continue providing the service to communities based on the theory of common-pool resources[31]. So, the ownership of water as a good or a service (e.g., piped water) could not be restricted only to private companies.

[28] The term public refers to the services provide by the government, and in this case to the decentralized governmental institutions working in the municipalities.
[29] Mixed companies refer to those who are composed by different associates whom could be individuals, government represents, private entrepreneurs, and communities.
[30] This is one the principles of neoliberal economic policies.
[31] This is a political and economic theory which considers that the resources of common use could be claimed as propriety of the state, of no-individual owners, or of communities' users of the resource SCHLAGER, E. & OSTROM, E. 1992. Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics*, 68, 249-262.

In this context, I briefly introduce some points in regards to the debate around pipe water service and provision to the vulnerable and poor populations. In Colombia, as it was mentioned before, there are three types of companies that can provide piped water service, and from those categories the public companies[32] and the mixed ones has showed good results in the provision of piped water where they have coverage. This is a different situation to the experiences in Bolivia, for example, where there have been processes of privatization implemented from the central government which allowed transnational companies to participate in the market of water provision (Laurie and Crespo, 2007, Marvin and Laurie, 1999). Also, in Bolivia there have been processes of popular contestations to that situation and a current central and governmental response to nationalize the water and the provision of the service (Laurie and Crespo, 2007). However, in both countries there is a similar discourse of whether the privatization of the service, following neoliberal economic policies, is the best option for providing pipe water service to the poor and vulnerable populations (Larner and Laurie, 2010, Castro, 2007). Also, there are similar examples of mobilization of communities for safeguarding the water resource and for being able to manage it as communities have been previously doing in the past. Nevertheless, this does not represent that these types of communities' initiatives do not adopt new technologies for bringing good provision of the service following international standards that guarantee the quality of the service, the responsibility towards the resource, the transparency in the management of the economic resources (Moncada-Mesa *et al*., 2013, Castro, 2007), and other issues that have been attributed as problem to the common-pool resources use (Fernández-Ruiz, 2002).

Additionally, the informality on the water service provision is another issue addressed by some authors as a problem in the both global north and south (Cleaver et al., 2014). Even defining informality in the provision of this service is complicated, as this topic has been considered since the political theory and the geographical and urban planning's perspectives. In addition, I consider that the informality in water use might be also seen

[32] The case of Empresas Publicas de Medellin-Public Companies of Medellin (EPM) is a good example of efficiency in providing the utility services to the city of Medellin, and metropolitan areas, since 1995 EMPRESAS PUBLICAS DE MEDELLIN, E. 2015. *Historia* [Online]. Available: http://www.epm.com.co/site/Home/Institucional/Historia.aspx [Accessed December 2015.

from the perspective of the need of poor and vulnerable populations to access potable water. In Colombia, this informal provision of the water service is considered as part of the problem of the informality of the settlements or the access barriers to remote areas where people live. As it was mentioned before, there have been governmental and society's responses to access the water service in both cities and rural areas. In this dissertation, I consider only three of the key points when examining the informality of water service's provision in conditions of rapid urbanization and migration (specially forced one). According to several authors (Moncada-Mesa et al., 2013, Subbaraman et al., 2013, Caprara et al., 2009, Castro, 2007) these points are: 1) the costs that people need to afford for enjoying the service; 2) the quality and quantity of the water that people can use; and 3) the reliability on the service that people are offered. Some of these points are discussed in the results displayed in chapter seven, section one.

To bear in mind

Until this point, it has been explained how unplanned migration waves could end in inadequate housing which can lead to inadequate settlement, and finally produce unplanned urbanization patterns; the unorganized growth of cities might lead poor people to live in vulnerable social and economic conditions that lead them to not have wellbeing. This situation could be worse for people who are forced to migrate from rural areas, and are not able to integrate with the urban environment. The consequences of this non-integration might be reflected in a lack of people's wellbeing especially in lacks of good health, which is very important in terms of public health interventions. In relation to general health, the processes of migration itself might lead people to either be more vulnerable for acquiring diseases they did not suffer before, or to have worst outcomes in "both physical and mental health" (Gideon, 2013, p165). Forcible migrants are at the same risk of health threats as other migrants, but they have also health outcomes as a result of being exposed to violent events. These health sequels of conflict might be worst in the case

of mobile populations who are minorities groups or are in underprivileged conditions (Dörner, 2001).

Migration and health

Usually, the migration and health relationship has a negative connotation, especially in the case of forced migration, because it is believed that migrants cause deterioration in the health of host places because of their different lifestyle, background, and culture. Nonetheless, not in all the cases have migrants poor health in comparison with locals, on the contrary there are cases were they can be healthier that host populations. For example, according to Lassetter and Callister (2009) some groups of 'voluntary' migrants[33] are characterized by a healthy status even better than a non-migrant counterpart. It seems that social factors can impact the health status of immigrants in host places; in other words, a migrant can be healthy in his place of origin and become sick in host places because of the new social conditions he is facing. Moreover, the same authors have mentioned that aspects such as:

> Length of residence, disease exposure, risky behaviours, lifestyle and living conditions, healthy habits, social support networks, cultural and language barriers, racism, and lack of awareness of local health beliefs practices (Lassetter and Callister, 2009, p93).

Those aspects might affect migrants' health outcomes and their relationship with healthcare services in host places.

Therefore, it is possible that health related problems in host places are the result of the cultural differences between locals and migrants and the consequences of the migration process itself. According to (Gushulak, 2001), the mobility process for travellers and migrants takes several phases such as "1) pre-journey situation, 2) the movement itself, 3) the reception and 4) the return" (Gushulak, 2001, p,263-265). Nonetheless, those phases are not similar for all migrants, in particular forced ones, because some of them might not

[33] Defined as a migrant who willing decide to cross boundaries.

plan any phase of the journey or their return. Same author also indicated that every phase has its own characteristics influencing migrants' health. For instance, in the first phase it is possible that migrants can have better health than the host population because of the 'migrant effect bias'; in other words, in many cases only people who have good health conditions or are young are able to migrate. In the second and third phase, other conditions such as, exposure to risks, unhealthy travel conditions, forcible displacement, and insufficient healthcare services offer, inequities and inadequate conditions for settlement in host places have an impact on migrants' health. Usually in host places, healthcare services are similar for all type of migrants without bearing in mind differences among these types of populations. Finally, for the fourth phase the author (Gushulak, 2001) recalled the difficulties that some migrants face when they return to their places of origin and cannot access the healthcare system because of their migrant status or other barriers.
Although IDPs are considered migrants too, their health needs and conditions might be different even in relation to other migrants in their countries, because of the fact that IDPs are forcibly displaced. Therefore, the provision of healthcare services and the design of public health programmes should address that fact and consider IDPs' needs.

Internal Displacement and health

IDPs have differences in relation to their health status and access to healthcare services than other migrant populations, and Leaning *et al* (2011) mentioned at least three. First, the difficulties faced by health authorities and facilitators to bring healthcare to IDPs when their counts are unknown; second, the healthcare services provision's disparities between rural and urban areas which have an effect on healthcare services provision for IDPs depending on where they are located. Third, the disparities in resources for healthcare services provision for IDPs and host populations; according to Aagaard-Hansen and Chaignat (2010) these differences could drive IDPs to be more at risk of suffering from infectious diseases in host places.

Thomas and Thomas (2004) described three phases of forcible displacement which have implications for IDPs health. First, the pre-flight phase in which vulnerable populations enduring poverty, social and economic disadvantages, and disparities in healthcare access are more likely to have poor health. These populations are also more likely to suffer forced displacement and do not enjoy good health conditions for starting their journey. The second and third phases are flight and post-flight respectively, and their characteristics are similar to Gushulak's phases (Gushulak, 2001) described above. However, the authors highlighted that in the post-flight phase when IDPs reach host places, and there are other emergent needs such as housing, food, water, and sanitation which could have negative effects on IDPs health conditions. Moreover the authors quoted, one of the thirty principles for Internal Displacement addressed by the United Nations which states that IDPs who are ill or injured should obtain healthcare attention without delays, and "have access to psychological services, especially, IDPs women should access female health care providers" (Thomas and Thomas, 2004, p118), and all IDPs should access preventive measures for avoiding infectious diseases among them.

The role of community networks and empowerment in migrants' health

As it has been mentioned, the migration process itself influences the lifestyles of migrants, but the effects of this process vary depending on several factors. For instance, the type and duration of the migration, the migration status, people's willingness or lack of it to migrate, and the conditions of the host place seems to affect migrants' wellbeing and health. In addition, the socio-economic conditions of migrants before starting the migration process might also affect their health. For instance, a study revealed that migrants tended to have poor health compared to Canadian host people, but the socio-economic conditions of migrants had a significant effect in their health when comparing to host populations (Dunn and Dyck, 2000). Pitkin Derose et al. (2009) found that Latin-American migrants in the United States have much lower education status and income than Americans. Those factors might lead migrants to find barriers in terms of the language and the access to the health

system, and as a result, migrants are more likely to have poor health in regards to host people. Additionally, other factors like gender, ethnicity, and cultural customs of migrants might also have an effect in how migrants adapt to the host area and how they relate to the host populations. Finally, migrants are often stigmatized when they arrive to host places, and even governments started to reserve the right of detaining migrants or travelers in case they represent a threat for public health (Gushulak et al., 2006).

In this context, many migrants find useful to stay connected with other people who share their same characteristics in host areas, as well as, with their relatives and friends back in the places of origin once migrants are settled. Eventually, social networks are established and work as an alternative for migrants to overcome health problems in host areas. As Menjivar (2002, 1997) found among Latin-American and Asian groups of migrants in the United States, these networks provide a broad range of aid alternatives to solve inmmediate and chronic health-related issues for themselves and their families. In addition, women have a relevant role as 'health providers' in these networks, as they offer care and advice to family members and to other migrants. The author also found that these networks included other 'health agents' such as pharmacists, traditional healers, catholic priests and Christian pastors. The networks also bring economic aid and advice to new migrants arriving to host areas. Social networks also work as a mechanism for coping with the migrants' anxiety and worries, as a consequence of their legal situation and the uncertainties of obtaining a job in host areas.

There are differences among men and women as migrants, depending on the causes of the migration process. In Colombia, for instance, before 1950 men tended to internally migrate and settled in developed regions looking to improve their families' economic conditions back in their places of origin (Giraldo-Samper, 1976). In contrast, in the Internal Displacement phenomena in Colombia women are more likely to move and settle in host areas in comparison to men (Ruíz-Ruíz, 2007). This difference in the migration pattern is important when considering political decisions in the area of gender equity; because women have been targeted by governmental programmes, in order to involve them in strategies for avoiding conditions of vulnerability, overcoming poverty, or bringing social

protection to them and their households. Some of these strategies consider women as passive recipients and do not consider them as subjects. Molyneux (2011, 1985) found in some studies done in Latin America that certain policies with gender approach hid the real interests of women, or their ability to be leaders and promoters of change within their families and communities. The author suggested two types of interests when designing policies, with a gender approach. First, the interests that lead to policies created for women, and second, the interests that lead to policies created by women. The former, "strategic gender interests", usually conceive women's "real interests to overcome women's subordination". The latter, "practical gender interests, are usually a response to an immediate perceived need" (Molyneux, 1985, p233) that women have observed in their reality and want to solve. Molyneux (1985) concluded in her study that policies with strategic gender interest sometimes do not establish a dialogue with women in the communities, and eventually, fail in the opportunity to empower women to change their current conditions. This failure might be affecting women as migrants in situation of forcible displacement who could not reach enough empowerment to overcome their situation.

To sum up, both social networking and empowerment should be considered when formulating and implementing policies in public health of IDPs and other mobile populations. Special attention should be given to a gender approach in these policies because of the key role that women play in the care of vulnerable populations' health.

Final words

It seems that migration is a Social Determinant of Health, so it is necessary to review the special health conditions of mobile populations. If these populations are forced to migrate, it is necessary to consider that they have specific health needs which required certain health services. Conflict as a driver of migration and as determinant of health should be also considered for assessing forcible migrants' health profiles, and for designing public health actions for them.

This research tries to assess if forced migration processes have an effect in the occurrence and epidemiology of dengue disease. Migration and urbanization processes are relevant for dengue, because dengue is largely an urban disease, and its transmission could be enhanced when susceptible people (who never suffer the disease like migrants) arrive in endemic areas (see chapters one and two). Given that migration and urbanization processes are different when people are forced to displace, it is necessary to see whether the factors related to these two processes have any effect in dengue. Colombia has been affected by Internal Displacement and dengue disease, reason why it seemed a good scenario to develop this research.

Given the complexity of the topics, Internal Displacement and dengue, a mixed method approach was designed to investigate them. In the next chapter this method is described, and its benefits and challenges are summarized too.

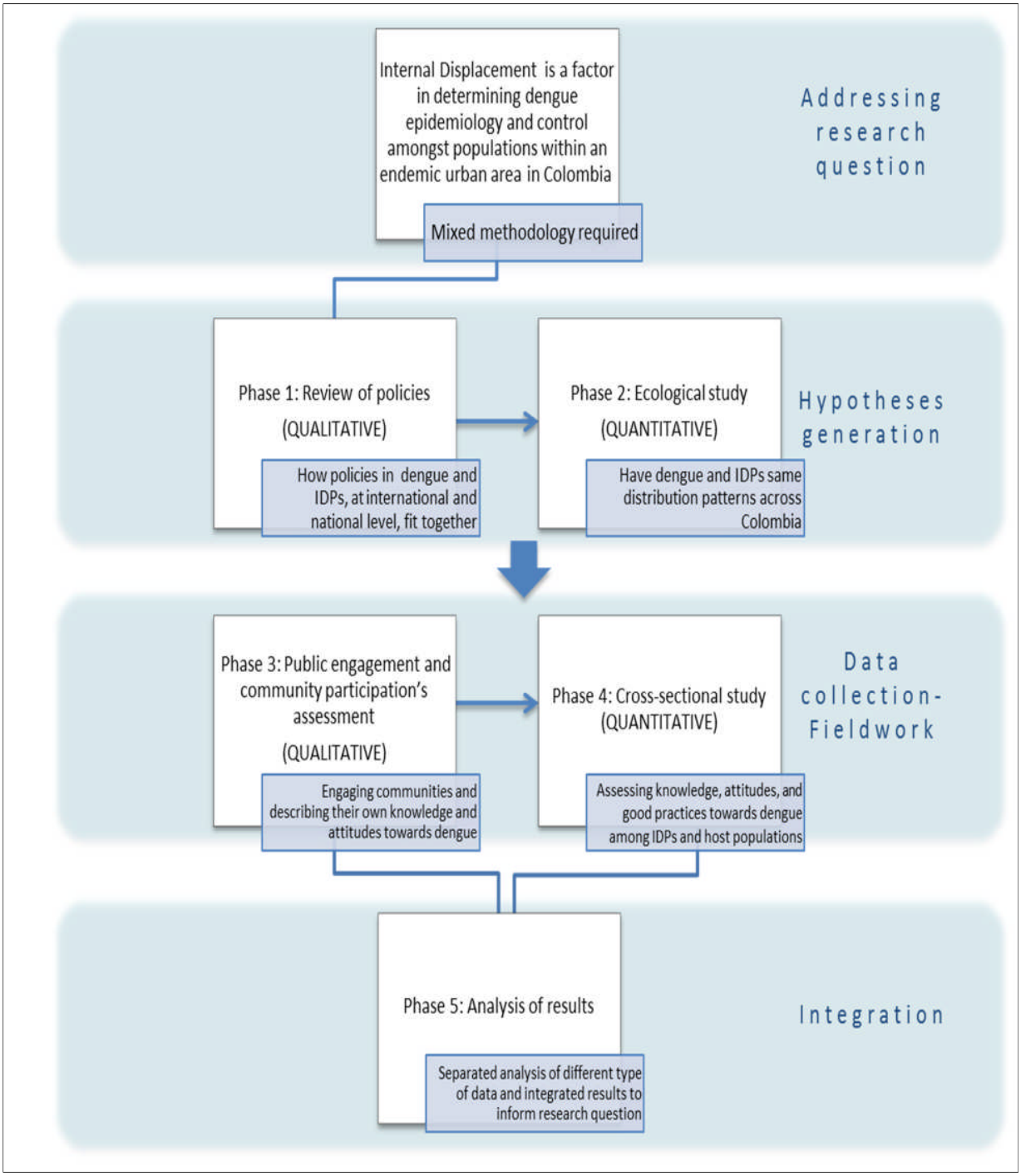
Chapter 3: Overview of methodological framework

This chapter describes the methodology used in this PhD study, first the design of the study is presented and explained. Second, the benefits and challenges of this research are summarized, and third, the ethical aspects of this research are explained.

Design and overall methods

As was mentioned in the introduction, this PhD uses a mixed-method approach. The study design is a sequential one divided in five phases. Phase one included a review of international and national policies in dengue and Internal Displacement. Phase two corresponded to a quantitative analysis using information of Colombian municipalities affected by dengue and Internal Displacement. Phases three and four corresponded to fieldwork developed in Colombia, in which both quantitative and qualitative methods were applied. Finally, phase five included the data analysis and integration of results which was done back in the United Kingdom (See Figure 14).

Figure 14 Mixed-method design in this PhD



(Author's own, 2015)

Table 6 summarizes the overall methodology of this PhD linking phases and chapters, and summarizing relevant characteristics of the methods were used in each phase.

Table 6 Methodology applied in this PhD

Phases	Specific aims	Approach	Sources/ process/ population	Level of information	Chapters
Phase 1	1. Describing dengue control policies and their implementation in endemic zones	Snowballing literature review/ Case study*	Published policies/guidelines/documents/ Data from work developed in La Dorada	International/ National /Municipal	4 (section 1)
	2. Describing Internal Displacement policies and social protection regulations	Archive research	Published policies/guidelines/ documents, grey literature review	International/ National /Municipal	2 (section 3) & 4 (section 2)
Phase 2	3. Characterizing distribution of dengue cases and their relationship with Internal Displacement	Ecological	Data bases INS/Municipal health division	National/ Municipal	5
		Archive research	Data bases DANE/Municipal mayor's office	National/ Municipal	5
		Geographical*	Data bases INS/IGAC/DANE	National/ Municipal	5
Phase 3 Phase 4	4. Assessing KAP towards dengue and its control amongst locals and IDP	Surveys design*	According to categories, knowledge, local conditions, neighbourhood, types of housing, health care access	Municipal	6
	5. Comparing vector counts and risk factor for having vector among IDP and host populations	Surveys evaluation, validation process and demonstrative experience*	Process of validating prior to testing the instrument	Municipal/ Household	6 (section 1)
	6. Comparing practices of storing water and containers emptying frequencies amongst locals and IDP	Focus groups: A) KAP, prevention and control B) migration and dengue, C) health care access	Locals, IDPs, key actors	Individual	7
	7. Comparing dengue self-reporting and health care usage risk factors among IDP and host populations	Interviews	Locals, IDPs, key actors	Individual	6 & 7
		Entomological surveys*	Collection of immature forms of the vector/Inspection of water containers	Household	7(section 1)
		Conglomerate sampling*/Snowballing sampling/ Cross sectional study	Sample of the locals and IDPs / KAP survey	Household	6 & 7

Phase 5	8. Applying the Social Determinants of Health (SDH) framework to analyze the effect of migration, urban environment, housing, and health access amongst locals and IDP	Statistical analysis /Framework analysis	Univariate and bivariate analysis of quantitative data /Framing qualitative information in pre-establish categories/Examining emergent categories	Analytical	6 & 7
	9. Integrating qualitative and quantitative findings for informing effect of Internal Displacement on dengue in Colombian populations			Analytical	6 & 7

*Collaborative work. (Author's own, 2015)

Overview of advantages and challenges

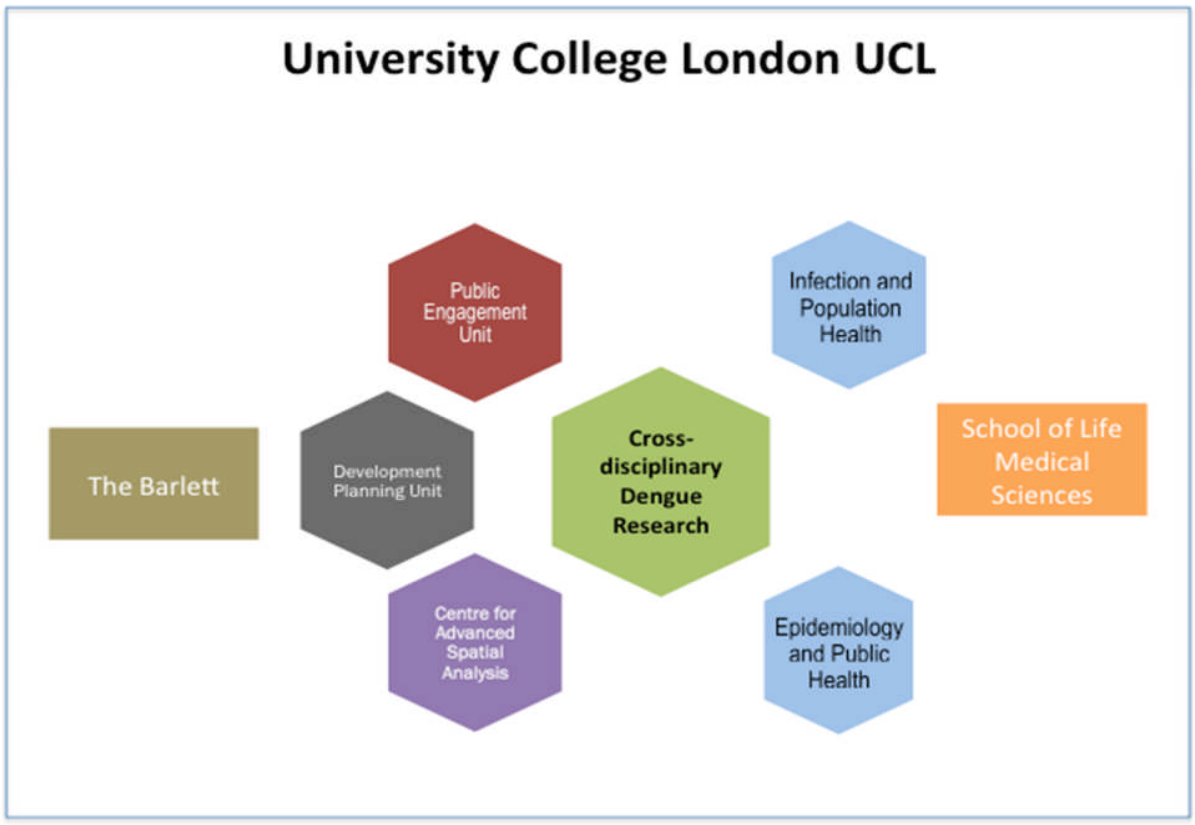
The overall structure of this PhD shows how complex it was to design it, to mix methods, to integrate and to present results. Therefore, during the duration of this project I came across with some advantages and challenges which are described below.

Advantages and challenges of the mixed-methods design applied in this PhD

On the one hand, the benefits of the design used in this PhD include applying qualitative and quantitative approaches in sequence, and answering questions rose by one approach using the other. Moreover, with this design I could develop both approaches through further training in both methods, and work with them along the duration of my PhD program. Moreover, I could rationally use the budget destined to do my PhD fieldwork, and I could develop collaborations for working with people from different disciplines both in Colombia and the United Kingdom (See Figure 15). Colombian collaborators in this research were:

- Centro de Estudios Sociales - Universidad Nacional de Colombia
- Instituto Nacional de Salud
- Centro de Estudios e Investigación - Fundación Santa Fe de Bogota
- Alcaldía de Armenia (Health Secretariat)
- Consultoría para los Derechos Humanos y el Desplazamiento

Figure 15 Collaborators of this research in UCL



(Author's own, 2015)

On the other hand, to avoid high time consumption, I consulted on the feasibility of this type of research with experts in the areas of infectious diseases and dengue, and I built a time-framework for developing the study. To address my lack of experience, I took several courses in both approaches, and I attended workshops to improve my skills since 2012. In the early stages of this PhD I developed a protocol which was evaluated by my supervisors, and I received feedback from my supervisors in all the stages of the design. Finally, the most important challenges for me were writing and publishing the mixed results, therefore, I decided to present them in chapters six and seven. Even though I have tried to show these mixed results in some conferences, they were not accepted, thus, I opted for presenting results separately. This situation is not unusual and some authors (Tariq and Woodman, 2013) have acknowledged that the combination of results is not easily accepted for all the

audiences, so for my further publishing plan I have considered to target journals that accept this type of research as an approach for studying dengue.

Benefits and limitations of the chosen qualitative and quantitative methods

Chapter 4: Policies in dengue and migration

A case study "focuses on understanding the dynamics present within single settings", (Eisenhardt, 2002, p9), so type of study seemed appropriated for assessing whether the policies in dengue have influenced dengue prevention and control programmes performance in a Colombian municipality. Eisenhardt (2002) stated that case studies allowed the researcher to use different type of data (quantitative and qualitative), which could be collected to several methods such as the ones applied in this research and described in table 6. The same author considered that case studies could describe the specific situation of the selected setting, and could be used for testing and generating theory too. A limitation for this type of study is the fact that there are not more cases to compare with, situation which might be not allow the researcher to generalize the results to several settings. In this research, given that data was obtained from a certain municipality, the analysis of results might not apply to other municipalities in the country. However, the case study might allow this research to generate hypothesis which could be addressed and investigated in a series of case studies in the future.

The policies in migration are not presented within a particular case study, however I did a critical analysis of those policies aiming to contrast the differences between the articulation of regulations in international law, and the articulation of the policies applied in Colombia. The main limitation of this approach is the lack of data which could add evidence for strengthening the comparisons presented. Nevertheless, until 2011 Colombia created the National System for Migration which has a systematic information about mobile populations in Colombia (Organización Internacional para las Migraciones, 2013).

Karpati *et al* (2002) considered that ecological studies allow to study the 'variability' of certain factors which could not be explored when comparing individuals, but rather when comparing groups of people as a unit of study. The same authors indicate the factors related to complex-system change "over time or space", and also those factors are influenced by interrelated determinants (Karpati *et al*, 2002, p1768). In this research, urban areas of municipalities represented the complex-systems, and the change of two factors (dengue and Internal Displacement) was assessed during some years in different municipalities of Colombia. Other possible determinants were included (see chapter five). Karpati *et al* (2002) indicated that the results of this type of ecological studies might be useful for public health, because they inform about 'variability' of the factors and interrelated determinants in groups of people rather than individuals. In addition, ecological studies might indicate whether there is a relationship or not between certain two or more factors.

Although ecological studies can be helpful indicators of the plausibility of causal associations, they have inherent limitations because the data used is aggregated rather than individual (Morgenstern, 1995). Firstly, given that the information used was from municipalities, a selection bias could happen if the selected municipalities do not follow predetermined criteria and do not allow the results to be extrapolated to other populations. For avoiding this bias, municipalities were selected according to pre-established inclusion and exclusion criteria. Secondly, an information bias could happen when the same instrument for collecting data is not applied. In order to avoid this bias the information came from the following sources: Instituto Nacional de Salud (INS), Consultoría para los Derechos Humanos y el Desplazamiento (CODHES), Departamento para la Prosperidad Social (DPS), and Departamento Administrativo Nacional de Estadística (DANE). All the institutions mentioned collected the data systematically in specific formats. Also a standard codification used in Colombia was used for linking data across all the datasets (a detailed description of datasets and secondary data is given in chapter five). Finally, the ecological fallacy is an important bias when analysing and interpreting results given that it explains how the effect of an association at one level of

information may affect the conclusions and extrapolations in other levels of analysis (e.g., results found in municipalities, may defer from possible results would have obtained from individuals). The differences in extrapolations are attributed to the differences between the characteristics of people when variables are analysed individually, in comparison of the characteristics for same people when variables are analysed at a group level.

Chapter 6 and 7: Results from fieldwork in Colombia

The type of quantitative approach applied in fieldwork was a cross sectional study with an entomological survey, and these type of approaches have benefits and limitations. In regards to the cross sectional studies, their benefits are the possibility of exploring hypotheses and identifying the potential determinants related to the events[34] studied in the research (Hernández and Velasco-Mondragón, 2000). The main limitation of this study is that is not possible to establish causal relationships between the studied events (Rivas, 2008).

Other limitations are the selection and the information biases, and in regards to the latter, this bias was avoided applying the same instruments to make the same measurements in IDPs and non-displaced households. The same trained people who went to non-displaced households, for applying the surveys there, went to IDPs households too. However, in this research there were some limitations which might lead to have selection bias. For instance, the fact that non-displaced populations were selected through a cluster-random sampling process while IDPs were not sampled in the same way might lead to an introduction of selection bias. Cluster-random sampling seeks to select people who are grouped by a similar characteristic in clusters, and the selection of these clusters reflects how people are grouped in the general population. Then, individuals (or in this research, households) are randomly selected from those clusters. Even though the data obtained from IDPs was not selected through the same method, it could be used for comparing with the data obtained from non-displaced households. In order to avoid additional selection biases, the non-displaced households, which were included in this research, shared the same Colombian

[34] In this case, dengue and Internal Displacement are the studied events

socio-economic stratum (defined in chapter two, section migration) with IDPs households. Freedman (2014), hypothesized that in the case of not applying randomization it is still possible to make comparisons of data using special statistical tests (non-parametric estimators).

Another limitation related to the previous one, it is the fact that until mid-2013 the national accounts of displaced people disagreed, and were provided by different sources; thus it was not possible to have a precise number for calculating the sample among displaced populations. At the moment to do the fieldwork, there were difficulties in order to reach displaced populations because of their safety and confidentiality rights. Therefore, the first group of displaced people that could be surveyed were the indigenous. In spite of this situation, the percentages of ethnic minorities among displaced population in this sub-study are consistent with findings published by other studies. It should be noted that this study included displaced people who recently experienced displacement, as well as people who were settled in Armenia for many years. Yet, when contrasting these results with other studies, it seems that displaced people suffer more socio economic deprivation, in spite of the time of their displacement, than non-displaced people. Finally, due to the fact that there is not enough available and published quantitative information about displaced people in Colombia, it was necessary to use several sources of information to contrast and validate these results.

In regards of the entomological survey, the method applied in this research allows to have accurate counts of the immature forms of the dengue vector, in special the accounts of the pupae forms. Pupae counts are relevant when is assessed whether dengue vector breeds and completes effectively its life cycle in containers holding water (Focks, 2003), in other words, to assess the containers in which the vector grows and survive rapidly. In spite that this type of entomological survey was applied in this research, it was not possible to obtain the measurements of immature forms from public areas surrounding IDPs households. These measurements are important to assess whether artificial containers filled with water and located in the public space are contributing to have dengue vector in the surroundings (Alcalá et al., 2015). However, the insufficient safety conditions in neighbourhoods were

IDPs were settled did not permit to make these measurements in public areas. Another limitation was that measurements of change in the temperature inside the households could not be done for this research.

Measuring knowledge and attitudes of mobile populations and host populations regarding dengue may have some limitations regarding the available literature to base this work on. In spite of community participation strategies which have been implemented for some years in Colombia, they have not been constantly evaluated, or their results have not been published; therefore, some of the available information is partly grey literature, archival information and experts' knowledge. The Colombian government implemented the Integrated Management Strategy (IMS) (San Martín and Brathwaite-Dick, 2007), and this strategy which was explained in chapter two. Basically, the IMS in Colombia sought that the State provided state and municipal health secretariats with dengue guidelines, for them to implement those guidelines and evaluate their impact in dengue prevention and control. Padilla *et al* (2012) stated that by 2011 the implementation of IMS showed some achievements, but those achievements were not equal across the country. In other words, in Colombia the IMS has different levels of implementation, as well as different levels of evaluation. In the case of Internal Displacement the situation could be even worse, because displacement was not properly recognized by the national government until 2013. Before this year, there were very few published studies about the health profiles of IDPs, and governmental and non-governmental organizations' reports (Hernández-Bello and Gutiérrez-Bonilla, 2008, Barceló Martínez, 2007, Salcedo Ramirez and Paredes, 2001). This lack of availability of literature to evaluate community participation in interventions, and the health profiles of IDPs in Colombia, might represent a disadvantage for baseline knowledge of dengue that facilitates comparisons between IDPs and host populations.

Ethical aspects

According to the Colombian decree 8430/1993 (Ministerio de Salud, 1993), and the UCL Research Ethics Committee Guidelines (2012), this study was a low-risk research for

human beings. Thus, it was required the participants informed consent for doing fieldwork in Colombia. Approval of both the UCL and Facultad de Medicina-Universidad Nacional de Colombia Ethics Committee were sought, and these committees approved this project in September 2013. Copies of these approvals as well as the informed consents are in appendix 3.

Final words

In this chapter, the methodology applied in this research was explained, as well as its benefits and limitations. This PhD study is complex not only for the research question that tried to address, but also for the variety of methods that applied and combined. However, this PhD is innovative in the areas of dengue and Internal Displacement precisely because of the same reasons. In the following chapters, the results of applying this methodology are described, analysed, and discussed. Policies in dengue and migration, national data analysis of dengue and Internal Displacement, main findings from information collected in fieldwork, and conclusive points and recommendations of this research are presented.

Chapter 4: Policies in dengue and migration

Statement of authorship

I carried out the work presented in this chapter. In the section one of this chapter, the quantitative data that is presented was already published in my master dissertation and in a journal article. Qualitative data was analysed by me and one part was published with a co-author in a book chapter. The other part of the data was analysed by me during the PhD, and will be submitted for publication in an academic journal.

In this chapter, dengue and Internal Displacement policies are reviewed. In the first section, information from my previous work in La Dorada is presented as a study case for analysing the implementation of policies to tackle dengue in that municipality. In the second section, a brief review of the legal framework of Internal Displacement is given, as well as a comparison between international laws and the Colombian legal framework.

Chapter 4, Section 1: A case study of policies' implementation in dengue control

This study case presents a critical analysis of whether the public policies in Colombia favoured the implementation of the Integrated Management Strategy (IMS) for tackling dengue in the municipality of La Dorada. First, the international and Colombia frameworks, that contain dengue prevention and control strategies, are given. Second, the study case data is presented..

Introduction

Dengue is an old disease which has affected countries in tropical areas since the 1600s (Gubler, 2004). International and local efforts have been made since then, but the disease still persists and affects human populations located in endemic areas. The difficulties for preventing and controlling the disease, as has been mentioned previously in this document, are mainly: 1) misdiagnosis and non-adequate clinical management, 2) unavailability of treatment, 3) vulnerable people living or moving to endemic areas, 4) geographic expansion of the vector, 5) lack of sustainability in dengue and prevention control programmes implementation and evaluation, and 6) lack of integration of community participation and multi-sectorial work for tackling dengue. This study case is focused only in difficulties five and six.

International legal framework for tackling dengue

One of the important international strategies acknowledged by some authors (Gubler, 2004, Suárez et al., 2004, Organización Panamericana de la Salud, 1995) was the continental campaign to eradicate the mosquito *Aedes aegypti* in the region of The Americas, which was almost successful. It is necessary to mention that this campaign worked well in countries with centralized governments, and which implemented the campaign as a vertical and hierarchical program with specific human and economic resources (Schmunis and Dias, 2000). However, it seems that the lack of temporal and economic sustainability led the campaign to fail (Organización Panamericana de la Salud, 1995), so in 1980 many countries in The Americas were re-infested by *Aedes aegypti*. Furthermore, by the end of the 1980s vector-borne diseases such as malaria, dengue and yellow fever continued to be a threat for human beings in different continents. Therefore in 1989 the World Health Organization (WHO) assembly called states to commit and to joint efforts and to adopt integrated strategies for controlling vectors (Mnzova A et al., 2011). The increasing insecticide resistance led WHO to promote the integrated vector control measures which also include work alongside with the community and multi-sectorial participation (World Health Organization, 1997).

During the period 1999-2002 the WHO published several reports whose highlights were included in the Global Prevention and Control Strategy for dengue. This strategy was focused on "strengthening epidemiological surveillance, reducing the disease burden, promoting behavioural change and also accelerating the research program" (World Health Organization, 2002, p2) aiming to reduce the expansion of the disease, and prevent outbreaks as well severe outcomes of the disease in endemic regions. Additionally, social mobilization, strategies of Information, Communication and Education (IEC), and behavioural change in people affected by dengue were promoted by the WHO (Parks and Lloyd, 2004, Parks et al., 2004). In 2004, the WHO launched the Integrated Control Vector framework which should be used by policy makers and health authorities for controlling vector-borne diseases (World Health Organization, 2004). By 2004, dengue was considered a re-emergent disease and a global threat affecting urban areas (Gubler, 2004). Given that

dengue was also considered a tropical disease related with vulnerable people living in urban areas (Suárez et al., 2004), it was included in the Neglected Tropical Diseases (NTDs) that the Millennium Development Goals (United Nations, 2015) aimed to tackle. Hence, the Special Programme for Research and Training in Tropical Diseases (TDR), which is a partnership between the WHO, the United Nation's Children Fund, the United Nations Development Program (UNDP) and the World Bank and research in NTDs, published the Report of the Scientific Working Group on Dengue in 2006. This document highlighted the main areas for research and for action towards dengue prevention and control: 1) an accurate diagnosis, 2) clinical cases integral care, 3) methodological steps for vaccine's implementation, 4) continuous dengue cases and dengue vector surveillance, and 5) integrated vector control (Special Programme for Research & Training in Tropical Diseases, 2006). The WHO Dengue guidelines for diagnosis, treatment, prevention and control (2009) included the areas mentioned in that report, and also contemplate as an area of research and action the opportune outbreaks' response. The WHO Global strategy for dengue prevention and control 2012-2020 (World Health Organization, 2012) also included the same areas, and considered the IMS as one of the pillars for dengue prevention and control. The IMS developed the activities described previously in chapter two, section dengue. In addition, the IMS seeks to have groups of experts from the countries, who will meet (in their regions and with the WHO) to coordinate dengue prevention and control activities in affected countries and do a close follow-up of their results (San Martín and Brathwaite-Dick, 2007) .

In the region of The Americas, the Panamerican Health Organization (PAHO) launched officially the IMS (2009), and according to San Martin and Brathwaite-Dick (2007) it has had different levels of implementation in the region during the decade of the 2000s. The results obtained by the implementation processes in the different countries could be grouped in 2 categories. First, an improved coordination within Ministries of Health, between Ministries of Health and municipal health secretariats, and with affected communities, and second the improvements done in the transference of economic resources, in the rapid response to outbreaks, and in the application of new technologies for doing surveillance. In the case of Colombia, a good coordination of the activities

between the Ministry of Health and the Instituto Nacional de Salud (INS) was achieved, as well as an inter-sectorial work with other Ministries and state health secretariats. Moreover, Colombia created a national plan for implementing the Communication and Mobilization for the Behavioural Impact (COMBI) in endemic areas.

These community participation interventions were social, mobilization, following the WHO guidelines. According to Suarez *et al* (2005), IEC and COMBI interventions were focused in educating people in endemic areas and they were mainly led by the health authorities. Nevertheless, there were other experiences developed by educative centres in partnership with the health secretariats, and some examples of these experiences were developed by Mosquera *et al* (2006) and Luna *et al* (2004). As was mentioned before, by 2004 Colombia had its own COMBI national plan, and also the country was implementing these interventions (San Martín and Brathwaite-Dick, 2007). Some of those interventions applied in the municipalities, were successful in raising the awareness of vector-borne diseases, but many of them did not have sufficient information about their results in the long term (Pacheco-Coral and Martínez-Parra, 2013, Pacheco-Coral et al., 2010). According to some authors (Toledo et al., 2007) a continuous evaluation and a follow-up of people involved are required for assessing successes of those interventions. Vos *et al* (2006) considered that the lack of evaluation and follow-up of activities of prevention and promotion within programmes of public health, could be partly attributed to a failures in the allocation of economic resources at the local levels (e.g., municipalities). As a result, the community participation intervention within the vector-borne disease program could have lacks of sustainability, which in the long term may have negative impacts in controlling those diseases.

Bearing this background in mind, I present the data collected in La Dorada, Colombia where the IEC strategy was implemented since the decade of the 1990s. I analyse whether lacks of sustainability of the IEC strategy and other components of IMS might contribute to failures within dengue prevention and control programmes.

Theoretical framework

In this case study, I take a pragmatic posture that allows me to analyze the collected quantitative and qualitative information from my previous work done in La Dorada. This allows me to work with information collected in fieldwork aiming to generate new knowledge that could be used in real scenarios (Wolf, 1999). For Dewey (1976), living organisms acquire knowledge through the experience with their surrounding environment because they are complex beings with multiple interactions. Likewise, he stated that in science the knowledge can be acquired not only through methodical observation, but also through action-interaction between living organisms and their environment (Biesta, 2011). Dewey suggested that knowledge production in science should be open to more than one paradigm; because paradigms are the result of interactions between theories, professors' stances, methodologies, and similar minded fellows associations. Therefore, scientific advances should be the result of these interactions in combination with a good methodological practice (Dewey, 1976). In the specific case of policy analysis, apragmatic posture allows to explore what are the responses of the subjects in regards to the implementation of policies (Wolf, 1999).

Focault (1988) considered that the subjects' contestations to power's exercises (such as public policies, or medicalization processes) might be the reflection of the subjects' resistance to be undermined as individuals by the exercise of power. In addition, Erasmus and Gilson (2008) considered that the exercise of power is relevant when evaluating implementation process and health policies' outcomes, because implementers, health providers, and patients might have mistaken ideas about the policy that is being applied. Also, the author mentioned the possibility of negative effects to patients and groups of population when the policies are not well implemented or re-implemented, or when beneficiaries are not taking into account for designing and formulating policies.

Same authors (Erasmus and Gilson, 2008) summarized several postures to examine the effect of power in policies' implementation and I refer briefly only to three of them: the bottom-up theories, the street-level bureaucracy, and the discourse analysis (policy

language analysis). In bottom-up theories, the implementation process is analyzed at the local level to see how implementers could achieve consensus, gain spaces, resolve conflicts, and eventually exercise discretionary power. The street-level bureaucracy assess whether these governmental workers exercise discretionary power when interacting with citizens within policies' implementation processes (Lehmann and Gilson, 2013). Finally, the discourse analysis is focused on how the discourse of implementers helps them to exercise power, and also is based on the premise that discourse is distributed across many institutions. Therefore, the idea of discourse analysis is assessing whether the dynamic between all the actors involved in the process have an influence in the implementation of a policy (Fischer, 2003).

Furthermore, it seems that there is not enough literature evaluating power exercises in health in low and middle-income countries (Erasmus and Gilson, 2008), and according to Gideon *et al* (2015) health policies evaluation in these countries continue focusing on impacts measurements and evaluations. In addition, Schiavo *et al* (2014) considered in their systematic review that in the case of emerging diseases, the studies developed in low and middle-income countries fail to assess health policies implementation. Nonetheless, there are recent efforts in Colombia (Velásquez et al., 2014, Pacheco-Coral and Martínez-Parra, 2013) trying to evaluate dengue policies implementation.

In this case study, I try to exemplify how people who are recipients of dengue policies implementation, in the municipality of La Dorada, have contested to the exercise of power that they have been subjects of. However, as Fassin (2007) considered, these contestations have tried to give a response to solve a health problem, to mobilise the community towards the search of better conditions of their health, and to built up community work for achieving community's wellbeing. As the author mentioned, these responses might be different from the "discourses on victimization" and "practices of the oppressed" postures (Fassin, 2007, p224) that are usually considered when describing community contestations to the exercise of power in policies implementation. In addition, the responses of people try to address dengue problem affecting their communities and it seems that their discourse differs greatly from the discourse of the implementers (especially from the

central government). Therefore, this situation could be the point in which there is not a dialogue between policy formulation at the national level and implementation process in the municipal level.

General description of the study site and data collection

As was described in the introduction, La Dorada is a municipality located in the Eastern zone of the Caldas state, in the left margin of the Magdalena River and has a temperature average of 28°C (centigrades). According to the 2005 national population census, La Dorada had 73.659 inhabitants, and by 2006, 95% of their population were concentrated in the urban area rather than in the rural (Alcaldía de La Dorada and Secretaría de Salud Municipal, 2007).

In the 2000s, the IMS had been implemented in most of its components and included the following activities: 1) home visits by vector control technicians of health staff, in which good practices towards dengue vector control were promoted. Some of the promoted practices were washing frequently containers holding water (where the mosquito can breed), and distributing chemicals for eliminating larvae forms (larviciding) in containers holding water. 2) Campaigns for rubbish collection and recycling with multi-sectorial and community participation. 3) Campaigns in local mass media and distribution of flyers, aiming to communicate good knowledge and attitudes towards dengue prevention. 4) Identifying potential community leaders and training them in the promotion of non-risk behaviours among community peers. 5) Training high-school students in dengue information's replication in their communities (Pacheco-Coral, 2008). Previously the introduction of the IMS, dengue control and prevention activities done by the SEM service had considered IEC as a crucial step to work alongside with communities. Educating activities (with high-school students) and rubbish collection campaigns had been the activities done by the public health workers. With the implementation of the IMS, the educating activities were extended to healthcare professionals, vector control technicians, and volunteer women from the communities. In addition, different sectors, stakeholders,

institutions (such as the municipal emergency committee) were involved in dengue outbreak preparedness.

By 2007, the IMS had been developed with more emphasis in three neighbourhoods acknowledged by the municipal health secretariat as the most disadvantaged ones, with the highest dengue cases incidences, and the highest entomological indexes (Pacheco-Coral, 2008). The three neighbourhoods were categorized as low according to Colombian socio-economic stratum (which compares geographical areas with the same housing and environmental conditions). Given that I did my master's survey in those neighbourhoods, I considered as the reference population the survey's respondents for selecting some potential interviewees to work with. Then, a random purposeful sampling was applied and a total of eight interviewees were included, and semi-structured interviews were conducted. The main characteristics of selected interviewees are summarized in table 7. Categories such as dengue knowledge, and attitudes towards dengue prevention and control were assessed in community member's interviews. The role of public health workers in dengue prevention and control municipal programmes was assessed too. Furthermore, part of the information about social and economic conditions, and community participation was collected through field take-noting and participant observation. In addition, interviews were transcribed and analysed, and information obtained was classified in pre-established categories.

Table 7 Description of interviewees in La Dorada, Colombia

	Interviews							
	1	2	3	4	5	6	7	8
Gender	Female	Female	Female	Female	Female	Female	Male	Male
Neighbourhood where living	1	1	2	2	3	1	N/A	N/A
Occupation	Housewife	Working in recycling company	Working in community centre		Working in her own store	Housewife	Public health -Caldas state	Public health –La Dorada
Condition to be	Settled in the study	Working with	Community	Working with	Community	Settled in the study	Public health	Public health

selected	region at least 10 years	community leader	community leader	region at least 10 years	worker	worker	

(Author's own, 2015)

Context of the selected neighbourhoods in La Dorada

The reference population was composed of 229 individuals, with a median age of 41 years and a female ratio of 5:1. Furthermore, 86% of the individuals had some education level. The unemployment reached 1.8% in this population. Of the 229 visited houses, 85.6% had a toilet (with flushing tank) and 14.4% latrine. Likewise, 97.4% of the households had at least one cement tank, and 25.3% of them had an additional cement tank for water storage (Pacheco-Coral, 2008). The main characteristics of the households were overcrowding, not enough ventilation and absence of a cooling mechanism, and a reduced space for people. In addition, these neighbourhoods had sectors which corresponded either to informal settlements or social housing projects (Pacheco-Coral and Martínez-Parra, 2013).

Application of Integrated Management Strategy (IMS) and Information, Education and Communication (IEC) strategy in La Dorada

La Dorada implemented the IMS almost since it was promoted by the PAHO, and the community participation intervention IEC was a central part of the same strategy. However, both the IMS faced problems in regards to sustainability during the first decade of the 2000s, moment in which there were insufficient funds leading to a discontinuity of IMs components.

By the end of 2007, IEC activities such as mass-media dissemination or regular home visits did not reach enough coverage due to lack of staff. However, it should be noted that community members training impacted more than 10% of the municipality's population (See Table 8).

Table 8 La Dorada's IEC activities and goals reached during 2007

Planned Activities	Activities frequency or impacted population (absolute numbers)
Television, radio and newspaper dissemination/times	12
Community peers & health practitioners' visits/time	24
Collecting recycling items and tires/households	1384
Fumigation/households	1487
Trained community members/individuals	11063

(Pacheco-Coral, 2008, p58)

For the period 2008-2012, the municipal health secretariat's plan for dengue prevention and control contemplated the majority of the IMS components: different types of control against the mosquito, environmental sanitation, IEC through flyers, newsletters, radio and television adverts, newspapers, and trained community peer's visits. Dengue knowledge will be imparted to students in the last year of secondary school. Public health workers should make home visits to each person who will be a dengue case, and in those visits the mosquito's counts inspection and the IEC should be applied. Additionally, focal fumigations and larviciding application will be done in the households where cases were reported. Multi-sectorial campaigns for collecting recycled items will be done every week in different neighbourhoods and twice a year in the whole municipality.

Nevertheless, quantitative data showed the lack of continuity for some of the IEC activities by mid-2008:

Table 9 La Dorada's IEC activities appraisal by the end of first semester 2008

Activity	Frequency	Percentage (%)
Community peer's visit within the last 6 months		
Yes	9	3.9

No	200	87.7
Do not know	19	8.3
Health staff's visit within the last 6 months		
Yes	8	3.5
No	201	88.5
Do not know	18	7.9
Received any informative flyer/newsletter within the last 6 months		
Yes	21	9.2
No	195	85.5
Do not know	12	5.3

(Pacheco-Coral, 2008, p64)

In addition, surveyed respondents who had knowledge about dengue prevention and control mentioned acquiring that knowledge through different sources rather than through the dissemination IEC channels.

Table 10 Sources from people had acquired dengue knowledge

	IEC	Other source	Do not know
Dengue	33%	51%	16%
Dengue transmission	66%	25%	9%
Mosquito	83%	12%	5%
Mosquito lives inside households	12%	80%	8%
Larvae	8%	84%	8%
Larvae breed in clean stagnant water	8%	85%	7%
Larvae breed inside household	11%	79%	10%

(Pacheco-Coral, 2008, p65)

Partnerships and participation initiatives in La Dorada's

Among different health and social problems, dengue and its vector represented another problem for the population of La Dorada. Therefore, people decided to undertake initiatives for tackling dengue in response to the lack of sustainability of IMS. Bearing in mind, that dengue was already a problem for the population of this municipality before the introduction of the IMS, the role of community leaders, partnerships, and social networking was crucial for them to tackle dengue. For instance, trained community volunteers started to gather together and talked about the problem of dengue and its vector in their neighbourhood:

> *[In the past] they [public health workers] said to me: "I have a small house or two small houses [for visiting], why you do not go with me?" That is [for me] what the health workers must do: to gather people so they collaborate, so they go to the streets [and reach other people]. There are ladies [here in the neighbourhood] who do not have anything to do. Suddenly, I go and talk to those ladies [about dengue and its vector] and if they want, I go with them [to their houses]* [sic] (Participant 5, La Dorada, 2008).

Moreover, community leaders started their own meetings with folks to talk about health problems. For instance a community leader talked about her initiative of working with housewives and their families seeking to impart knowledge about dengue and other relevant health issues:

> *We work with twelve families...Visiting families [and] workshops have been done [by me and other 3 leaders]... During the visits, [one each of us] work by our own; during the workshops we gather [together] and work with six [families] instead of three ... We also set a families' meeting each month* [sic] (Participant 3, La Dorada, 2007).

Likewise, certain community initiatives were established around the same time aiming to work in those areas neglected by the government. For example, a recycling cooperative was found by some community members who wanted to formalize their own way of living. This initiative was important because this cooperative contributed with waste disposal, one of the activities contemplated by the IMS for dengue control:

> *We began [to work] with cars in which we loaded the [recycled] material since 5 years ago. We [also] began to visit [houses] door to door. There were people who did not open the door to us; other treated us bad [because they thought] that the government was sending us... [Once] I said to one lady ... "we do not [work] with the Mayor, we are poor and the majority [of us] paid rent for our houses[35]"... [When we have enough collected items] we put [them] in the warehouses; when one [warehouse] fills, we make cardboard pacas[36]... and they [cooperative leaders] load them [in a truck for sending them] to Bogota; they [cooperative leaders] do those trips every eight days* [sic] (Participant 2, La Dorada, 2008).

Workers of the cooperative had started home visits 'door-to-door' asking people for their disposable waste. In those visits, they explained to people what was the meaning of the term *recycling* and its relevance for preventing health problems such as dengue. This cooperative also did some informative flyers for people. The cooperative's income relied on the profits obtained from selling the recycling material to other companies in Bogotá (Colombian capital city). Once the company was well known in the municipality, the municipal health secretariat invited the workers to join the rubbish collection's campaigns.

IMS sustainability in La Dorada: failures and successes

Although public health workers and communities welcomed the introduction of IMS and were involved mainly throughout the IEC strategy, the IMS sustainability has been affected

[35] In this quote, the interviewee wants to highlight her own low socio-economic condition which is reflected in not having the opportunity to be the owner of her own house.
[36] A paca refers to putting boxes, or cardboard, or recycled items together and tying them.

because of the way that the municipality operationalized the guidelines issued by the Ministry of Health. Moreover, when the State decreased the budget destined for public health, the municipality planned its public health programmes according to the allocated budget rather than to the public health priorities. As a result of this, the human and economic resources were scarce within the vector-borne disease control programmes and the sustainability of some strategies, such as IMS, was affected. So, vector-borne disease programmes in the municipality prioritised activities such as environmental sanitation, spreading insecticides or distributing larviciding products. Although there were resources for hiring public health staff trained in vector-borne diseases, the number of contracts was reduced. Likewise, insufficient funding was a barrier to develop the IEC strategy and multi-sectorial activities, and to hire trained workers who could do prevention and control.

Moreover, people assumed different positions in regards to the lack of sustainability of IMS. For instance, some of them adopted practices such as washing the containers holding water or using larviciding products. Conversely, others were sceptical about the activities promoted by public health workers. Others opted to refuse being engaged in IEC, participating in campaigns for collecting recycled material, or attending educative meetings organized by their peers. Additionally, people began to demand a greater governmental commitment to dengue prevention, control, and treatment. In spite of all of these problems, communities continued mobilizing members and developing initiatives aiming to tackle dengue. It seemed that those efforts had good results in replicating dengue knowledge among community members.

Although people considered as members of the same community, for them was clear that there were cultural differences between those who arrive for rural areas and those who were living in the urban area of the municipality. Furthermore, they acknowledged the impact of conflict in the municipality, the increased poverty, and the scarcity of jobs for people living in those neighbourhoods. All of these social issues were relevant for them, as those issues were related with health outcomes. In addition, some people considered that the processes of forced migration led people who arrived and settled in those

neighbourhoods, to have different perceptions and practices towards dengue control in comparison with people who had been living there for longer periods of time.

Conclusion

Dengue is a disease which prevention and control is embedded in a broad legal framework at the global, international and national levels. However, not always these policies are articulated in all the levels, because the policies application in a State depends on global forces (economic, social, and political). Colombia is a good example of this situation, because Colombian public health policies follow international guidelines, however, the application of those policies in the country depends on the State's organization. In the late 1900s, Colombian State adopted a neoliberal model of development which introduced decentralization processes in the country. The decentralization processes not only reformed administrative areas, but also specific areas such as the social protection system and the healthcare provision services.

Given the complexity of dengue and its multiple determinants, dengue's policies should be articulated to tackle this disease. However, if the application of those policies is segmented, the policies do not achieve the expected prevention and control actions towards dengue. Colombia is a good example of this situation, because in the country dengue polices should be implemented by decentralized states and municipalities, which not always could accomplish a sustainable implementation of those policies.

In the Colombian municipality of La Dorada, the implementation of dengue policies has not been a straightforward process. In spite that the municipality has tried to follow the international and national dengue guidelines, the applicability and sustainability of those guidelines depended on the administrative organization of the municipality. Therefore, the strategies designed to tackle dengue has been partially implemented which is reflected in failures to develop activities in dengue prevention and control. In addition, the expected

impacts from these strategies in communities affected by dengue have not been totally accomplished.

Bearing in mind that communities in La Dorada acknowledged dengue as a problem for them, they have lead community participation activities for their members aiming to prevent and control dengue. These community initiatives seemed to have covered the lacks of in the municipality's strategy sustainability, as well as to raise the awareness of dengue prevention and control in affected communities.

The case study illustrates that in order to implement the policies to tackle dengue, it is not only necessary to follow the guidelines which are globally agreed, but also to assure that the application of those policies could be harmonized with the organization of the states and their administrative structures within countries. The case study also pointed out the relevance of community participation in dengue prevention and control programmes. In La Dorada, people acknowledged dengue as a problem for their communities, and this situation might motivate them to promote community initiatives towards dengue control, initiatives which seemed to work even when the official strategy failed.

The next section contains a brief summary of the legal framework in migration, and the policies issued at the international level and in Colombia are summarized. Some critical reflections about the application of these policies are outlined too.

Chapter 4, Section 2: Migration legal framework summary

In this segment a summary of the legal framework for migration at the international and Colombian levels is presented. Bearing in mind, that this summary is not a systematic review of all the existent laws in the migration field, some critical reflections about this framework are given.

Overview of legal framework

The current International Legal Framework for Migration is vast and includes different topics related to the movement of people (Organización Internacional para las Migraciones, 2006), and some policies from other fields (e.g., economic, social, political) considers migration as an important topic. The framework only considered the regulations which allowed me to situate the Colombian Internal Displacement phenomenon in a national and international context (See Table 11). Nevertheless, the International Migration Organization (IOM) included some of these laws and regulations to elaborate the Colombian migratory profile 2012 (2013).

Table 11 International and Colombian legal framework for migration

International			Colombian	
Migration field	Law	Description	Law	Description
Regulations relevant to Migration and return	American Declaration of the Rights and Duties of Man, Bogota, Colombia/1948	Right to have a residence and freedom of movement within a nation	Law 74/1968	Adoption of the Universal Declaration of Human Rights approved by United Nations in 1948
	Universal Declaration of Human Rights/1948	Right to freedom of movement and residence within the boundaries of a state, to leave any country and to return to the original country	Law 74/1968	Adoption of the economic, social and cultural rights approved by United Nations in 1966
	Protocol No. 4 to the European Convention of Human Rights/1963	Freedom of movement and prohibition of expulsion of nationals	Consejo Nacional de Política Económica y Social, CONPES 3606/2009	Integrated Migration Policy for Colombia
			Law 1465/2011	National System for Migration

International			Colombian	
Migration field	Law	Description	Law	Description
Regulations relevant to Refugees – Internal Displaced People (IDPs)	United Nations Refugee Convention/1951		Law 35/1961	Adoption of the United Nations Refugee Convention approved by United Nations in 1951
			Law 387/1997	Measures for preventing Internal Displacement and for providing social protection, safety, and socio-economic stabilization of the IDPs
			Constitutional Court sentence T-025/2004	Declaration of the unconstitutional state of affairs for the IDPs (this sentence states the existence of a systematic violation of IDPs' rights)
			Decree 250/2005	National plan for the integral attention

			of the IDP
		Consejo Nacional de Política Económica y Social, CONPES 3400/2005	Prioritization of resources destined to social protection of IDPs
		Law 107/2010	Measures for care and integral reparation to the victims of human rights violations, and measures for violations to the International Humanitarian Law
		Law 1448/2011	Measures of care, assistance and reparation to the victims of the internal armed conflict.

Author's own elaborated with data collected from (Organización Internacional para las Migraciones, 2013, Bello, 2004, Krieken, 2001)

Critical reflections

The complex legal framework in which migration is contained indicated the challenges that this topic poses at national and international levels. According to the IOM, migration is currently a global issue which should be addressed by all countries in a consistent way with regards to terminology, regulations, and in a coordinated fashion (Organización Internacional para las Migraciones, 2006). The IOM has also been working in the elaboration of migration national profiles in different countries aiming to collect data about migration processes. It is understood that this information facilitates to issue new public policies for migration at the international level and to develop programmes for migrants worldwide (Organización Internacional para las Migraciones, 2013). However, the creation, implementation, and regulation of legal frameworks for forcible migrants such as refugees and IDPs are steps, which can be more challenging for national states and international organizations. Therefore, it is necessary to consider carefully that forcible migration is not an isolated issue of certain countries, but a dynamic problematic influenced by global forces (e.g., economic, political, and social). Nonetheless, without the international cooperation in designing dynamic legal frameworks and protective mechanisms for these migrants (which might be adopted by affected countries), IDPs who will be not protected by their own state could become refugees or asylum seekers in other countries. For instance, as the Colombian conflict and the numbers of IDPs were increasing, the government was issuing the legal framework to respond to these emergent issues. This is the reason why the different regulations for IDPs have been created in different years; however, the delays in the implementation of legal protective mechanisms led people affected by Internal Displacement to leave Colombia seeking refuge in other countries. Many of these migrants face problems in terms of accessing to food, shelter, and social protection systems in the countries where they are temporally located (Organización Internacional para las Migraciones, 2013). Therefore, in order to avoid these undesirable consequences of migration processes, countries both affected by Internal Displacement or refugees, could work together by improving conditions for migrants, and developing programmes and legal framework which would protect them.

Final words

In this chapter, legal framework for dengue and migration were reviewed and analysed. As mentioned above, this review highlights the challenges for generating mechanisms for prevention, control and issuing new regulations given the complexity of both dengue and Internal Displacement. In this review, it was not possible to identify whether both legal frameworks overlap in any point, which might suggest that dengue was not considered as a priority for IDPs and vice versa, at least when the reviewed policies were issued. The Colombian State considered that IDPs health profiles should be assessed, for accomplishing the specifications addressed in Law 1448/2011 (Ministerio del Interior y de Justicia, 2011). This law mandates the state and municipal health secretariats to assure that IDPs enjoy adequate provision of healthcare services. Therefore, it seems pertinent to study the relationship between dengue and Internal Displacement to contribute with the creation of IDPs health profiles in Colombia. In the next chapter, data obtained from Colombian institutions about dengue occurrence and Internal Displacement was analysed and compared, aiming to evaluate that relationship between dengue and Internal Displacement.

Chapter 5: National data analysis

Statement of authorship

I analysed the secondary data and carried out the work presented this chapter. A collaborator from the UCL Centre for Advanced Spatial Analysis (CASA) elaborated the maps displayed at the beginning of the chapter. This collaborator used secondary data provided by this research, and geographical data was obtained from Instituto Geográfico Agustin Codazzi (IGAC). For the epidemiological analysis that I performed, the secondary information was obtained from datasets provided by the Instituto Nacional de Salud (INS) and the Consultoría para los Derechos Humanos y el Desplazamiento (CODHES). Other secondary information was downloaded from Departamento para la Prosperidad Social (DPS) and Departamento Administrativo Nacional de Estadística (DANE) websites.

This chapter present epidemiological analysis of national datasets with information of dengue and Internal Displacement in Colombia. First, an overview of the dataset used in this chapter is given. Second, as a background, a geographical analysis of how dengue and Internal Displacement are spatially distributed is displayed. Third, an epidemiological analysis with data of dengue occurrence and Internal Displacement cases is presented.

Overview of national datasets used as sources

SIVIGILA

Specifically for dengue, SIVIGILA (chapter two, section two) follows the World Health Organization (WHO) dengue cases definition and cases are sub-classified in four categories: probable, confirmed by laboratory, confirmed by epidemiological nexus and mortality by dengue. The flux of information is once a week (denominated epidemiologic week), except for the severe and lethal cases which should be immediately reported by the Unidad Notificadora de Dato- Reporting Data Unit (UND). Furthermore, the probable cases should be either confirmed or discarded by the UND every month (denominated as epidemiologic period). The reporting form includes demographical, geographical, epidemiological, clinical and laboratory information; also the main indexes of analysed information are percentage of probable cases per epidemiologic period, incidence of dengue, lethality by dengue, proportion of hospitalized cases caused by dengue, and the percentage of viral isolation samples.

SISDES- CODHES

The Sistema de Información sobre Desplazamiento Forzado y Derechos Humanos en Colombia (SISDES) is the Internal Displacement and Human Rights Information System in Colombia developed by CODHES (Consultoría para los Derechos Humanos y el Desplazamiento, 1999). This system uses a methodology based not only on the movement

of people but also on the context in which the movement is produced. The Colombian Episcopal Conference had piloted Sisdes from 1993 to 1995; then the information collected in those years was saved and the collection methodology was changed. This last change aimed to include more variables allowing the evaluation of the context in which the displacement was produced (e.g., causes, reasons to move, people involved, places where Internal Displacement was produced, evidence of conflict, violation to human rights, etc.). Currently, Sisdes seeks to generate updated information, to tackle causes of Internal Displacement, to protect IDPs, to advocate for human rights, and to promote social protection for IDPs. Moreover, Sisdes has three key components: surveillance, reports about households suffering Internal Displacement, and early warning mechanisms to avoid more forced migration (e.g., intra-urban Internal Displacement).

CODHES' methodology for sampling is based in a regional consultation with institutions and Non Governmental Organizations, working with IDPs, and a continuous mass media's update in regards to IDPs' numbers. After analysing the information a final number is calculated, and it corresponds to the area where the sample is obtained (Consultoría para los Derechos Humanos y el Desplazamiento and Unicef, 1999).

The Sisdes' surveillance component is based on two main activities: 1) CODHES researchers do a review of mass media and governmental reports in order to track potential cases; and 2) the researchers undertake fieldwork in the municipalities affected by Internal Displacement, seek the potential households' cases and apply a survey. The information obtained is saved, processed, and analysed by CODHES; then, the analysed information is compared to other sources and reviewed by experts in the area of Internal Displacement. The household's survey included variables such as places where IDPs were forcibly displaced, places where IDPs arrived, conditions for resettlement or return, socio-economic conditions, demographic profile, psychological problems, conceptual map of provided aid and list of aiders, family typology and social networking with other Internal Displacement households, social organizations or Non-Governmental Organizations (NGOs).

Sistema Unico de Registro–Unique Registry System (SUR) -DPS

The Departamento para la Prosperidad Social-Colombian agency for Social Inclusion and Reconciliation (DPS) is a governmental branch which is in charge of designing policies, programmes, and strategies for supporting and advising victims, for assisting vulnerable populations' protection, and helping all these population in the process of being reintegrated to society. It should be mentioned that several governmental agencies and institutions composed DPS aiming to bring together collaborative work and multidisciplinary teams.

Before the year 2010, it was the Social Security Network that had collected the official statistics of IDPs through the information system Sistema Unico de Registro–Unique Registry System (SUR); from 2010 and onwards this system belongs to the DPS. In its origins, SUR was defined as the Unique Registry of Internal Displaced System, and was created and organized according to the Colombian legal framework for IDP (Ruíz-Ruíz, 2006). SUR applies a methodology known as the estimation of displacement by contrasted sources in which the information of place of displacement, place of arrival, resettlement and return status, are linked together. In contrast with SISDES-CODHES, SUR collects the information for both individuals and households, through official institutions helping the IDPs and also through IDPs registry.

After this process, researchers from DPS contrast the information obtained with non-official institutions and NGOs at the different regions; the first step is to contrast the information with one institution and if there is any discrepancy of 5% or below, the information is contrasted with another institution. In order to reach an agreement, the information is newly contrasted with the second institution consulted and also with the primary source.

There are certain difficulties that SUR has faced through the years in regards of underestimating the Internal Displacement. For instance, until 1999 the Ministry of Internal Affairs was in charge of the system and it lacked the appropriate instruments for

collecting data; also, from 2000 until 2010 the Social Security Network was responsible for the system. This network depended on the Presidential social agency Accion Social which was not exclusively dedicated to work on Internal Displacement. By this moment, Accion Social was the only institution responsible for collecting, verifying, analysing, and reporting information about IDPs. This situation led to underestimated IDPs statistics which disagreed not only with other national sources (Consultoría para los Derechos Humanos y el Desplazamiento, 2011a), but also with international sources (Amnesty International, 2009). In 2013, the Colombian government recognized the number of IDPs in Colombia (Centro Nacional de Memoria Histórica, 2013), and since then DPS has tried to integrate different sources and to update the numbers of IDPs across the country (Unidad para la Atención y Reparación Integral de las Víctimas, 2013).

Census 2005 and population projections - DANE

DANE has done 11 population censuses and the methodology used has greatly varied among censuses. For the census 2005, DANE used a methodology known as inter-censual conciliation which is composed basically of two methods. 1) Application of the survey in Colombian households (direct method); and 2) analysis of information obtained from previous census (1985 and 1993) comparing demographic, mortality, fertility and migration information (indirect method) (Departamento Administrativo Nacional de Estadística, 2009b) . This information was the foundation for building population projections retrospectively and prospectively for each year in the period 1985-2020. A population projection is defined by DANE “as the result of combining demographic, mathematic, or other types of estimations aiming to establish the explanatory variables of population dynamics and to predict the demographic characteristics of those populations” (Departamento Administrativo Nacional de Estadística, 2009b, p18-19). For these specific population projections it was assumed the existence of cohorts within the general population with their own patterns of fertility, mortality, and migration.

The census 2005 had 6 components: 1) identification, 2) housing information, 3) household information, 4) peoples' information, 5) economic information and 6) agricultural information. The first component is the geographic details of household's location; the second component is a description of housing type, materials and utilities coverage. The third component includes a description of households' socio-economic conditions. The fourth component includes all the demographic information of people living in the household; finally, the fifth and sixth components include the information about economic, agricultural and livestock activities (Departamento Administrativo Nacional de Estadística, 2009a).

For the census 2005, people were included in certain geographical area if they live in the surveyed household, even if they were absent when the survey was applied. Likewise, IDPs were included even if that household was not located in their permanent place of residence. However, IDPs living in a hostel were registered in their permanent place of residence, and not included in the geographical area where the surveyed hostel was located. In the population projections the numbers of IDPs were included in migration fluxes assuming that Internal Displacement would have a decreasing tendency in the oncoming years.

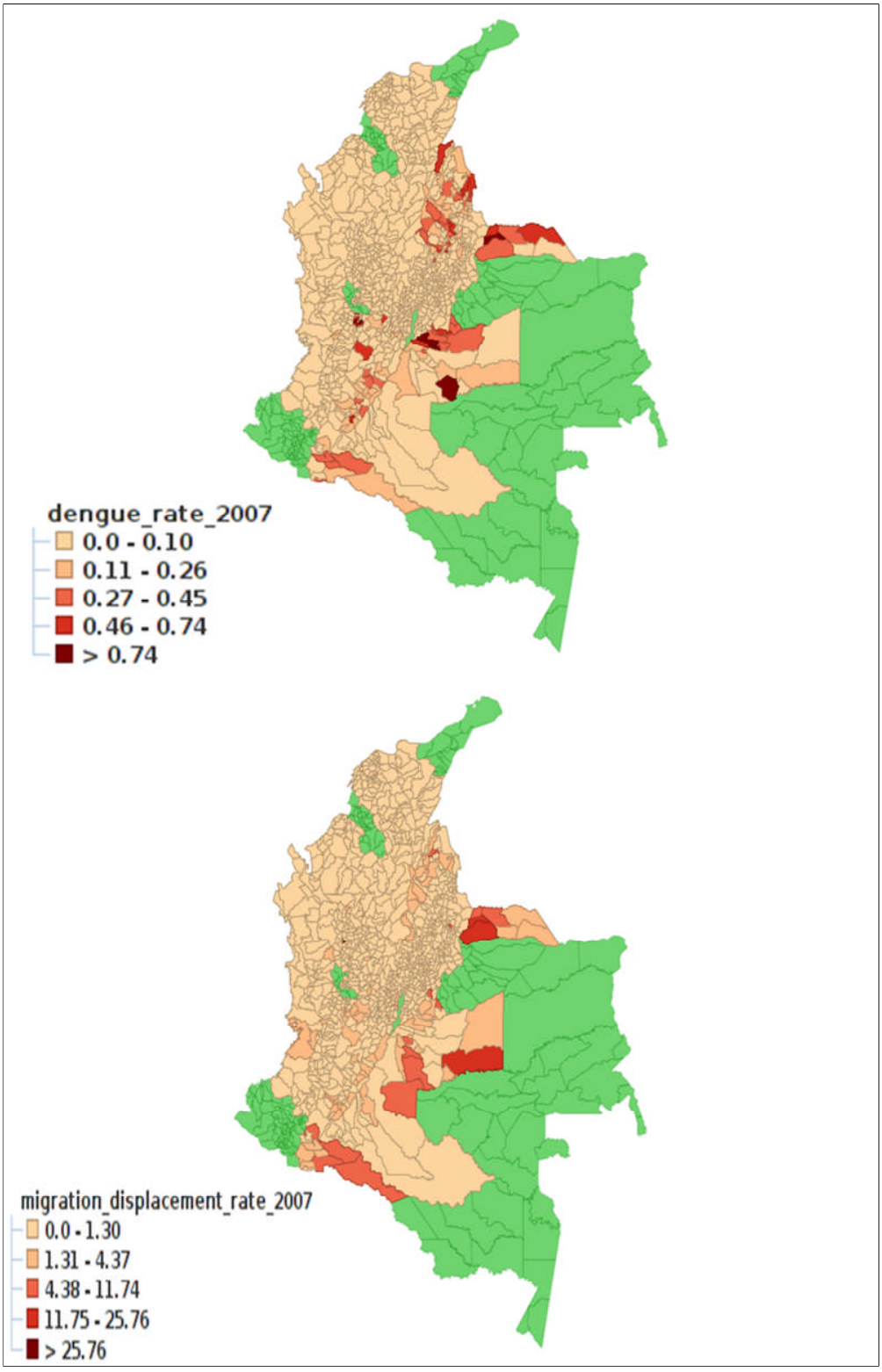
Divipola-DANE

Divipola is the standard code used for identying the territories in Colombia (chapter two, section one). Each state, municipality, and town has a code that identifies each territorial unit (Departamento Administrativo Nacional de Estadística, 2012a) . This codification is updated frequently in order to have the correct information about the territorial organization of the country.

Spatial distribution of dengue and Internal Displacement in Colombia: a background

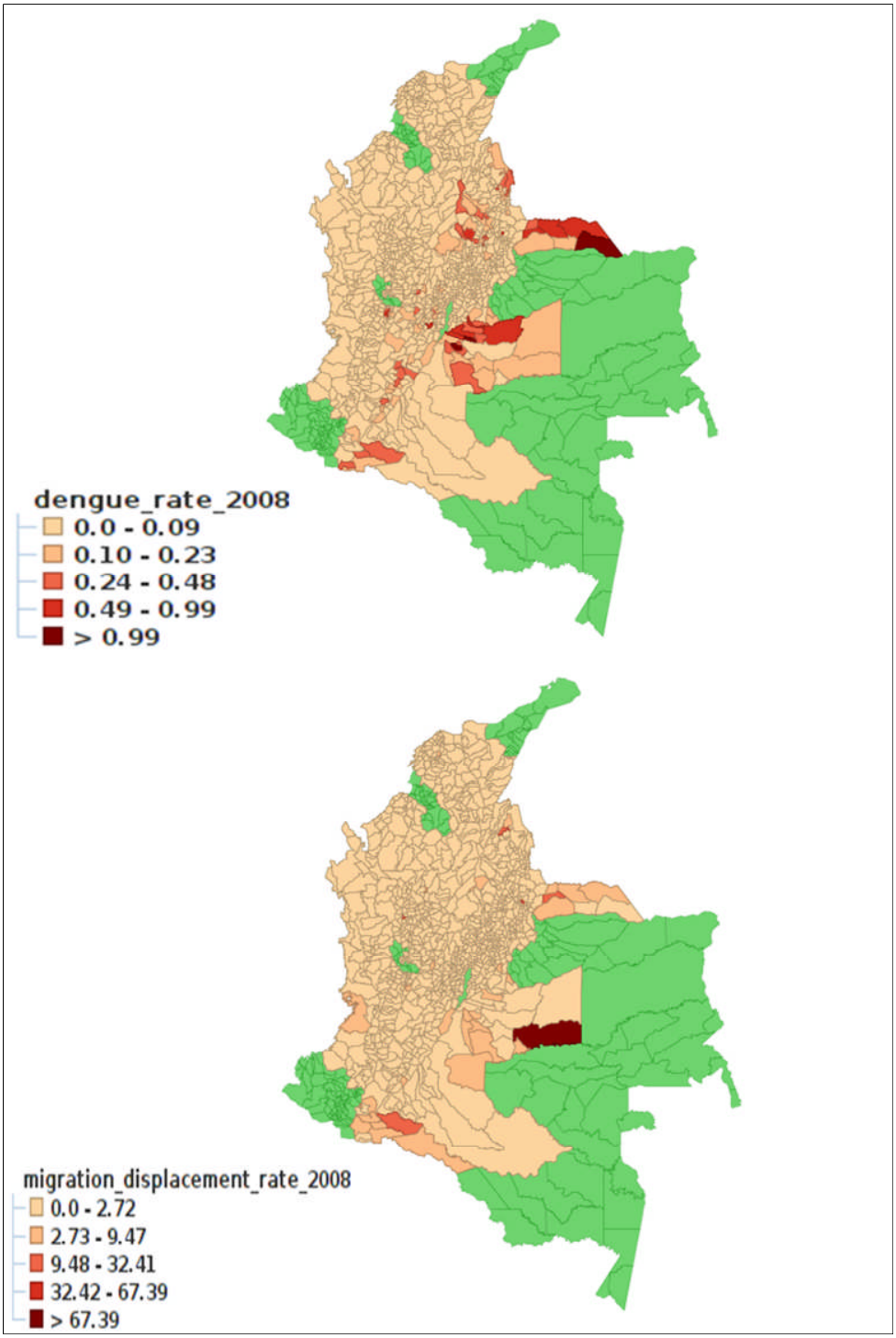
Four-year period information of dengue and Internal Displacement cases from ten Colombian states was analysed in the program ®geoDa. The 10 states were selected because of their rates of dengue, as well as high rates of Internal Displacement. Period 2007-2010 was selected because in the year 2010 the highest epidemic of dengue was occurred in Colombia, and the three previous years were non-epidemic ones (Padilla *et al*, 2012). The municipality was the study unit, and municipal rates of both events rates were calculated; rates were constructed with the number of cases for every event over the population of the municipality per each year analysed (See Figures 16-19).

Figure 16 Spatial distribution of Dengue and Internal Displacement, Colombia, 2007



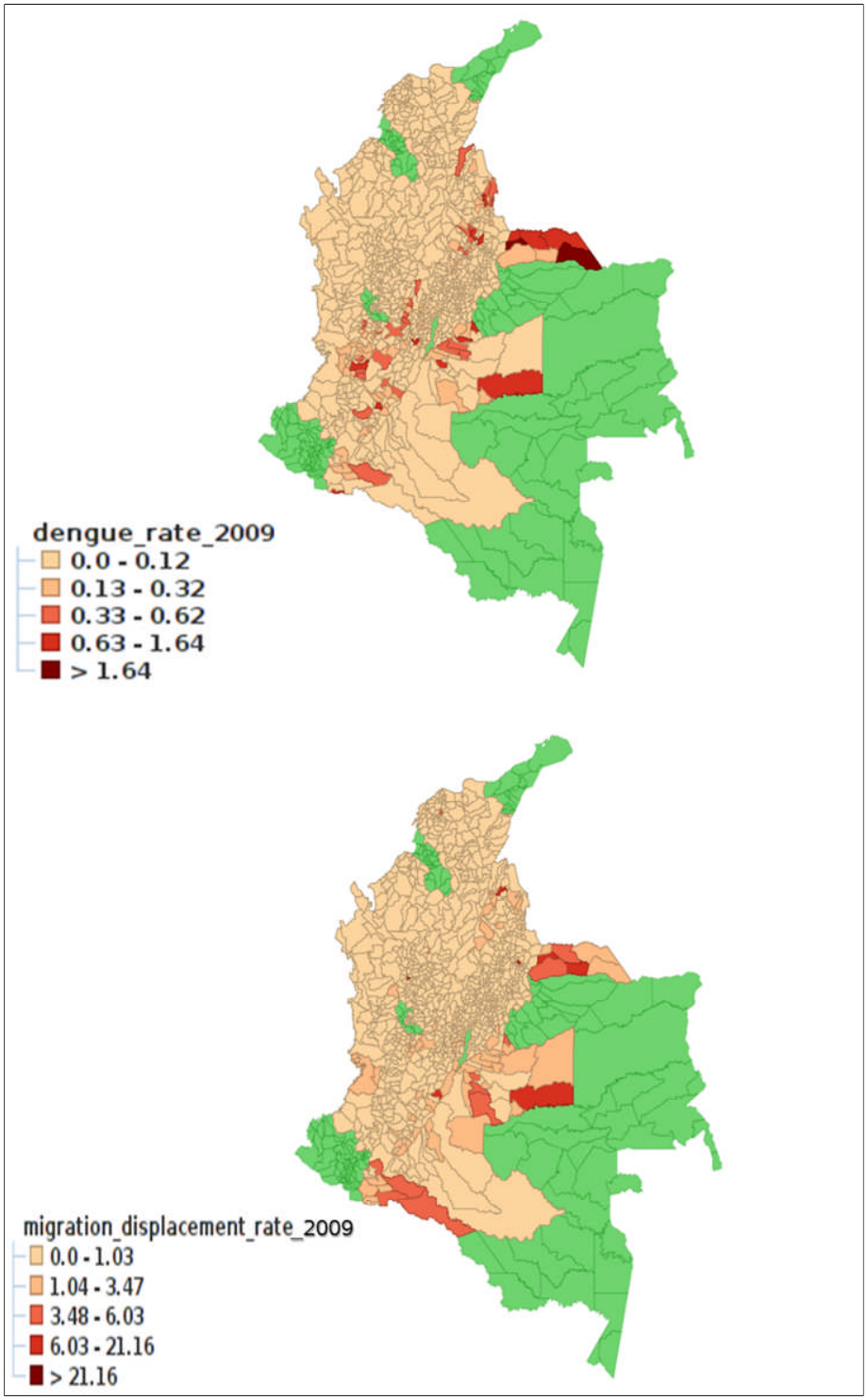
(Vargas-Ruiz and UCL Centre for Advanced Spatial Analysis, 2012a)

Figure 17 Spatial distribution of Dengue and Internal Displacement, Colombia, 2008



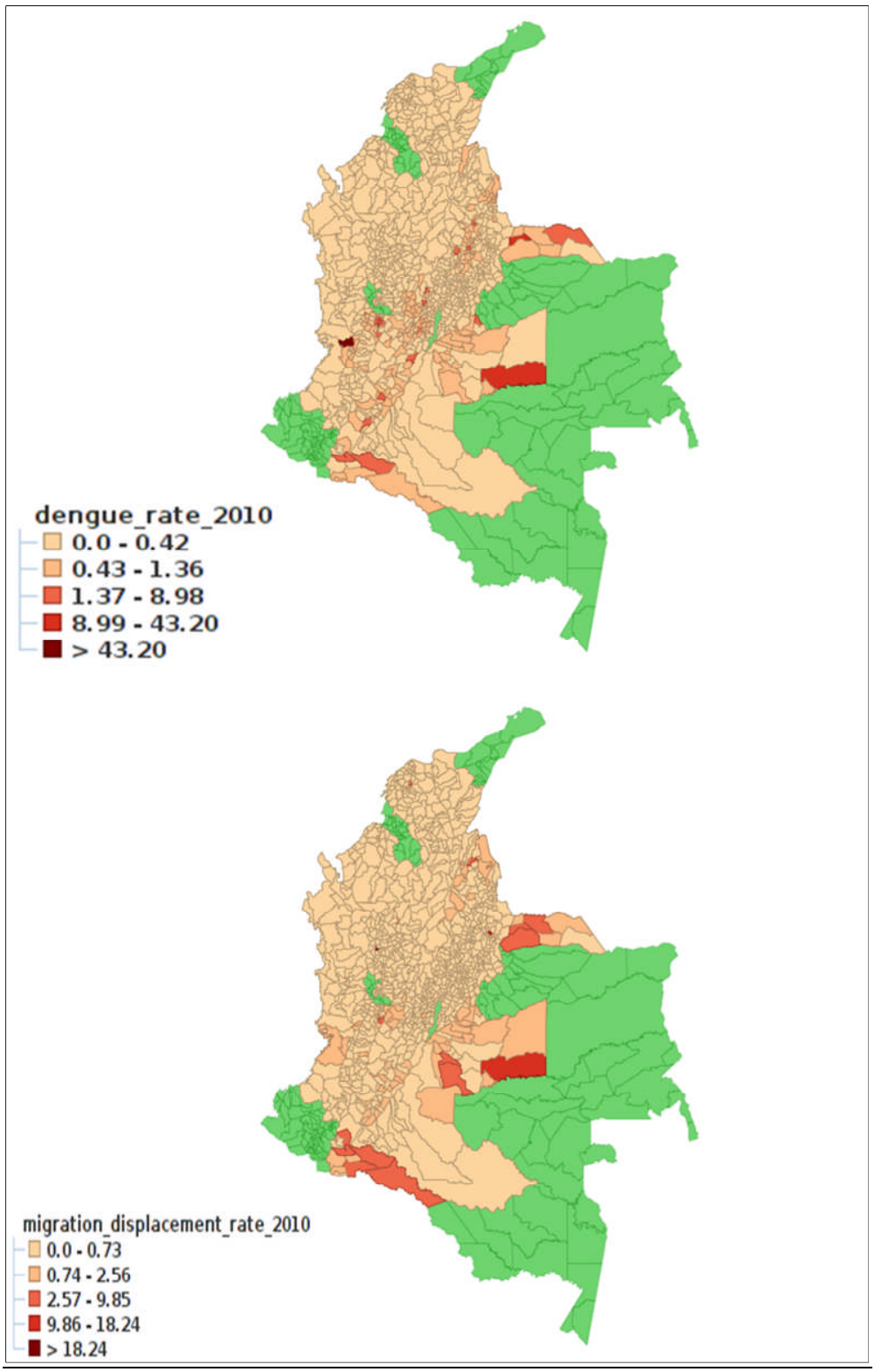
(Vargas-Ruiz and UCL Centre for Advanced Spatial Analysis, 2012b)

Figure 18 Spatial distribution of Dengue and Internal Displacement, Colombia, 2009



(Vargas-Ruiz and UCL Centre for Advanced Spatial Analysis, 2012c)

Figure 19 Spatial distribution of Dengue and Internal Displacement, Colombia, 2010



(Vargas-Ruiz and UCL Centre for Advanced Spatial Analysis, 2012d)

Geographical and spatial methods help epidemiological analysis to describe causal relationships or to investigate determinants related to certain disease for which the location in the space is relevant (Pérez et al., 2012). The displayed maps indicate that the high rates for dengue, as well as for Internal Displacement were found in concurrently in some municipalities in years 2007, 2009, and 2010. Another interesting finding is that in the states where high dengue rates do not coincide with high rates of Internal Displacement in the same municipalities, other municipalities next to the ones reporting dengue had high rates of Internal Displacement. This finding might indicate that the movement of people in and out of a region (in this case states) influence the dengue occurrence in hyperendemic areas. Finally, this background indicated that a detailed analysis of dengue and Internal Displacement using data from epidemic and non-epidemic years.

Epidemiological analysis

Data management

Information from datasets

SIVIGILA

- Databases used correspond to the years 2010 (epidemic) and 2011 (non-epidemic), and contained the individual reporting of dengue confirmed cases per municipality (Instituto Nacional de Salud, 2012) .

SISDES-CODHES

- Datasets used correspond to years 2010 and 2011, and included data of IDPs households founded in host (receptor) municipalities. Sisdes' data is the primary source for IDPs' information used in this chapter (Consultoría para los Derechos Humanos y el Desplazamiento, 2011b).

SUR-DPS

- Datasets used correspond to the years 2010 and 2011 aiming to contrast the information obtained through SISDES (Departamento para la Prosperidad Social, 2012).

Census 2005 and population projections - DANE

- Datasets used were population projections for years 2010 and 2011 per municipality. In order not to over or sub estimate IDPs in municipalities, the number of IDPs reported by Sisdes was subtracted from the total of municipalities'

populations (Departamento Administrativo Nacional de Estadística, 2012b). Available variables such as temperature, altitude, and domiciliary utilities coverage were obtained from census information and Mayor's office websites.

Divipola – DANE

- Divipola was the codification used to link the data from the datasets obtained through different sources and institutions (Departamento Administrativo Nacional de Estadística, 2012a).

Datasets were reviewed and organized, and then linking data was done across them. Then, a merged dataset was imported to ®STATA. The unit of analysis were Colombian municipalities reporting dengue cases for the two years (2010 and 2011). Some municipalities were excluded because they did not have the report of dengue or the age of the individuals. Finally, the analysis explored dengue, IDPs, and predictor variables such as temperature, altitude, utilites coverage (piped water, sanitation, and rubbish collection) and size of the urban area in 247 municipalities reporting dengue cases and hosting IDPs. Data from population were organized in seven age groups according to the categories in which obtained IDPs datasets were classified. In addition, this categorization also allows examining the occurrence of dengue[37] in dissagregated ages.

- Age group 1: 0-7 years
- Age group 2: 8-11 years
- Age group 3: 12-18 years
- Age group 4: 19-59 years
- Age group 5: 60-74 years
- Age group 6: 75-79 years
- Age group 7: >80years

Age standardised rates for the events dengue (number of dengue cases over a two year period per 1,000 population) and IDPs (number of prevalent IDPs in the population over a two year period per 1,000 population) were calculated, applying to a standard population

[37] Dengue occurrence is important in the early ages of life as it affects children ; however in Colombia as in other Latin American countries dengue also affects young adults greatly.

the age-specific rates from each one of the selected groups. Because of small numbers in some areas in 2011 non-epidemic year, biennial rather than annual rates of dengue and IDPs were calculated to give more stable estimates.

Results

Graphical trends in dengue and IDPs showed that both outcome and IDPs have a log distribution (see Figures 24 and 25). The model used a logarithmic (In) transformation of the biennial age standardised rates of dengue and the biennial age standardised rates of Internal Displacement. Then, both dengue and IDPs where transformed to their natural logarithm (In) and showed normal distribution (See Figures 22 and 23).

In figures 20 and 21, the X-axis shows the age-standardised rates of dengue and IDPs and the Y-axis the percentage of municipalities per each rate for the 247 municipalities:

Figure 20 Log distribution Dengue

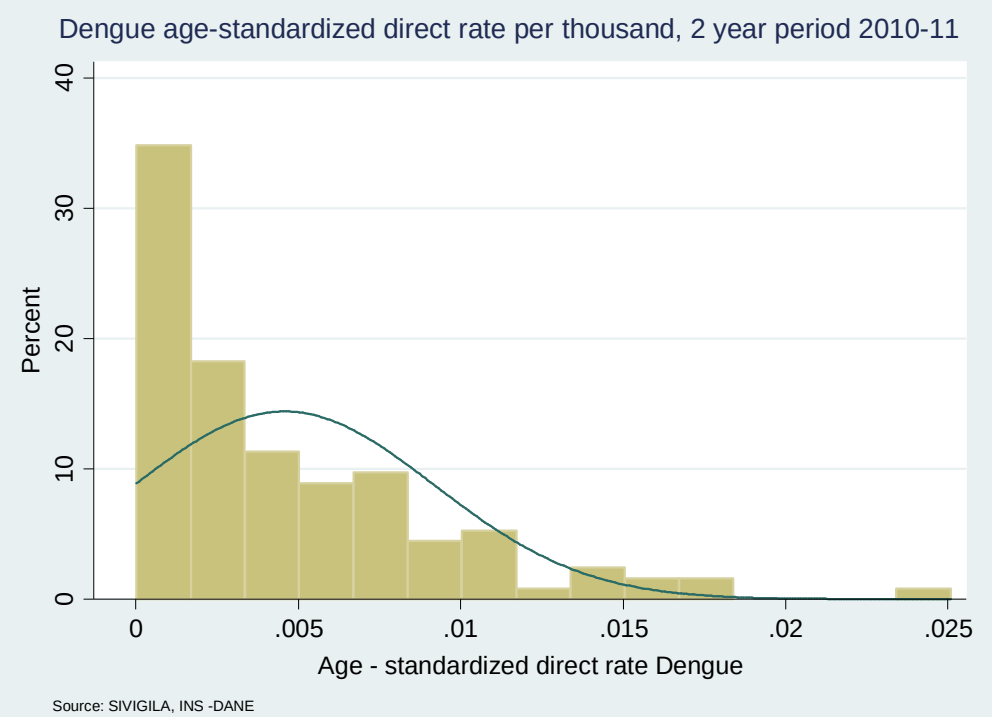
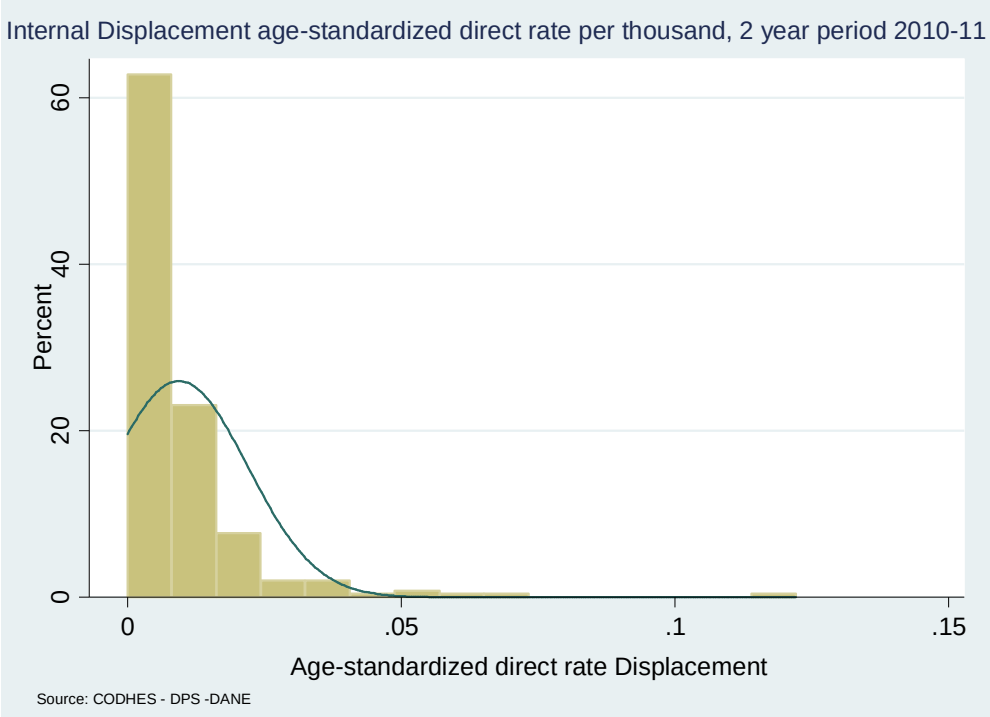


Figure 21 Log distribution IDPs



The figures 22 and 23 show in the X-axis the transformed age-standardised rates the Y-axis the percentage of municipalities per each rate of the 247 municipalities:

Figure 22 Normal distribution logged dengue

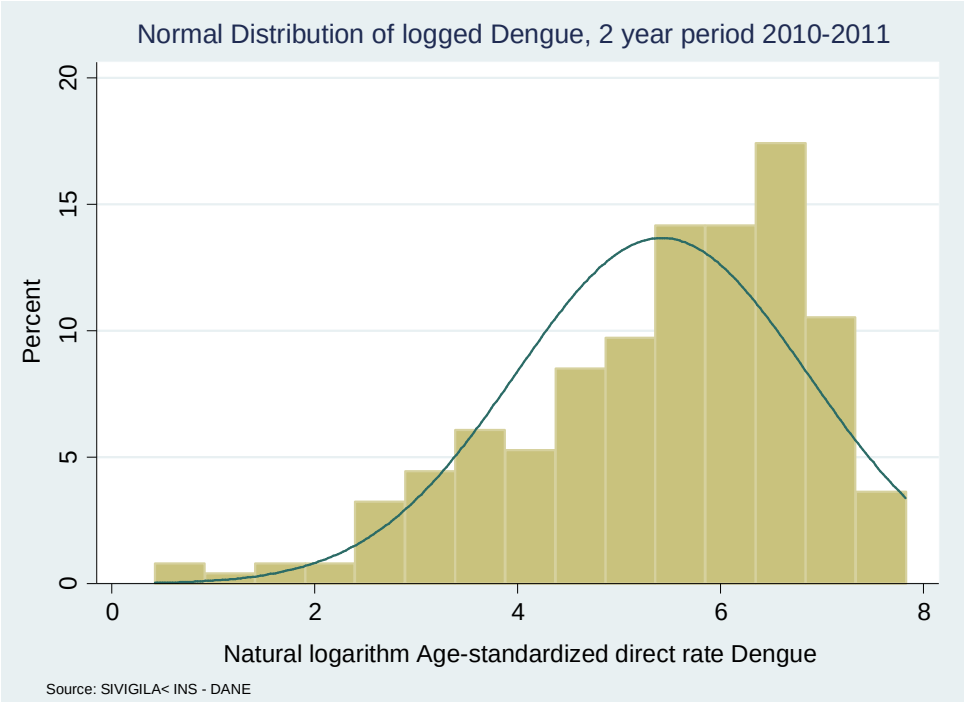
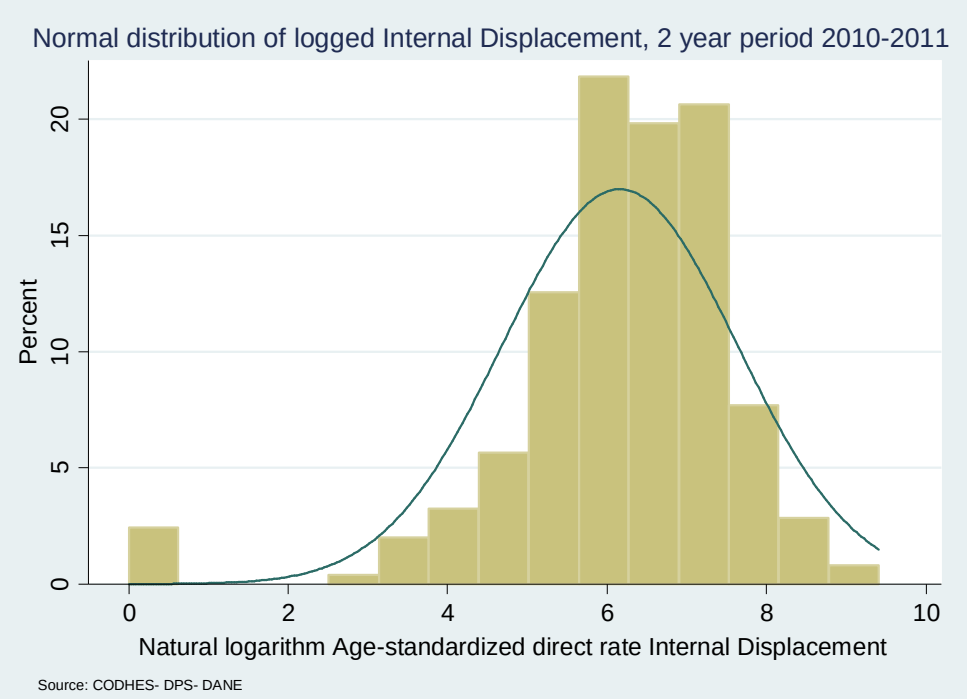


Figure 23 Normal distribution logged IDPs



After the transformation, the crude rates were calculated for dengue and IDPs per thousand 1 person-year. Given that the data was transformed to their In, the geometric means (exponential) and 95% Confidence Intervals (CI) were calculated. Both geometric mean and CI were back-transformed (antilog calculation). The arithmetic mean is also presented for comparison, as well as, the age-rates frequencies for dengue and IDPs (See Figures 24 and 25):

Figure 24 Frequencies of crude and age-group rates for Dengue

Dengue crude rate, arithmetic and geometric means, years 2010 & 2011

	Crude dengue 2010	Crude dengue 2011
Observations	246	247
Geometric Mean*	2.3	0.063
95%CI*	1.7 2.6	0.055 0.073
Observations	247	247
Arithmetic mean*	4.4	1.4
95%CI*	3.8 5	0.1 1.8

Dengue rates per age groups frequencies over a 2-year period (2010-2011)

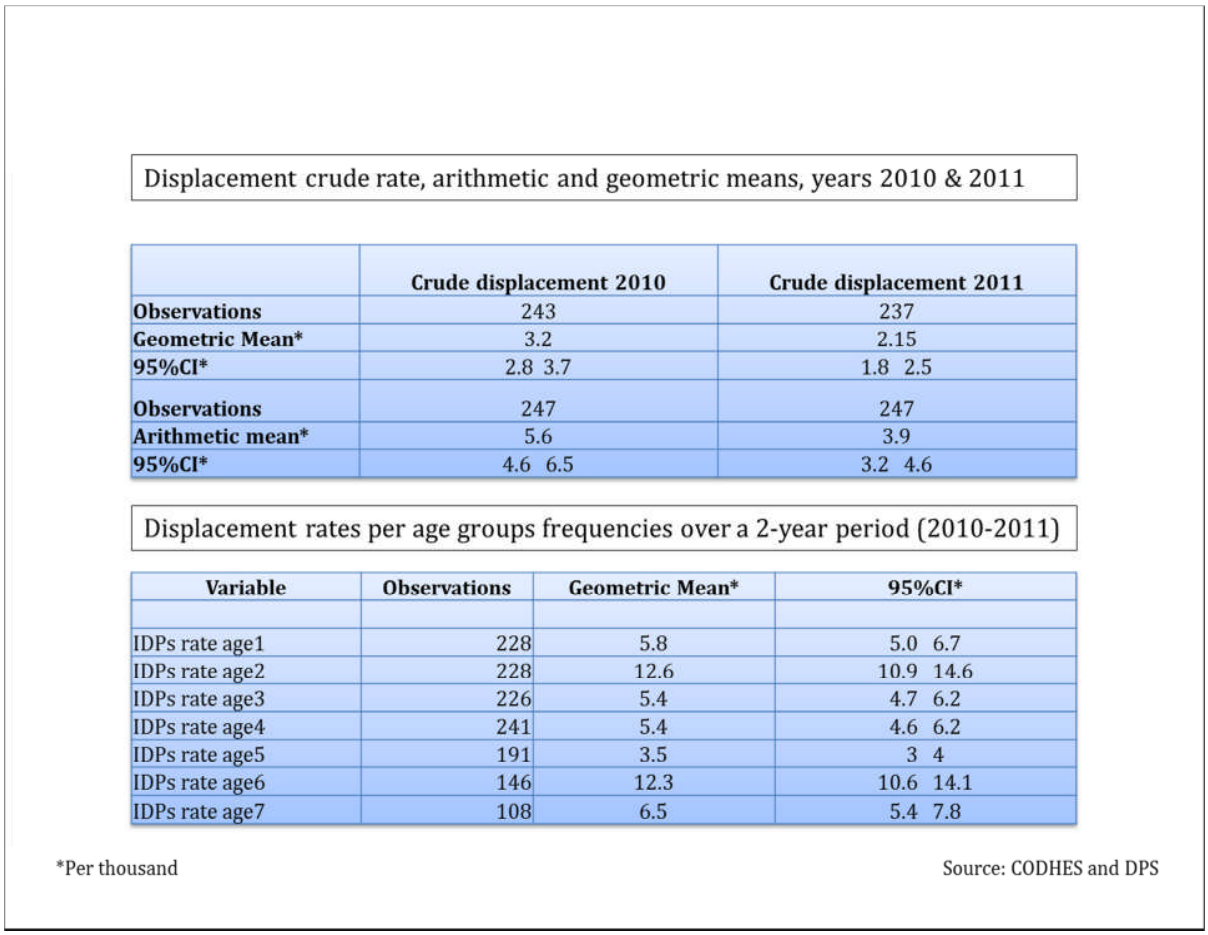
Variable	Observations	Geometric Mean*	95%CI*
Dengue rate age 1	223	3	2.5 3.6
Dengue rate age 2	214	4.2	3.5 5
Dengue rate age 3	234	3.2	2.6 3.8
Dengue rate age 4	244	2.0	1.7 2.4
Dengue rate age 5	192	2.1	1.8 2.5
Dengue rate age 6	115	4.1	3.4 5
Dengue rate age 7	110	4.2	3.4 5.3

*Per thousand

Source: SIVIGILA, INS

Dengue age-group rates ranging from 2 to 4 /1,000 over 2-year period and showing younger groups were more affected. IDPs age-group rates were around 5/1,000 2 person-years in almost all ages. Age groups with rates of 1/100 over 2-year period were infants and elderly.

Figure 25 Frequencies of crude and age-group rates for IDPs



Displacement crude rate, arithmetic and geometric means, years 2010 & 2011

	Crude displacement 2010	Crude displacement 2011
Observations	243	237
Geometric Mean*	3.2	2.15
95%CI*	2.8 3.7	1.8 2.5
Observations	247	247
Arithmetic mean*	5.6	3.9
95%CI*	4.6 6.5	3.2 4.6

Displacement rates per age groups frequencies over a 2-year period (2010-2011)

Variable	Observations	Geometric Mean*	95%CI*
IDPs rate age1	228	5.8	5.0 6.7
IDPs rate age2	228	12.6	10.9 14.6
IDPs rate age3	226	5.4	4.7 6.2
IDPs rate age4	241	5.4	4.6 6.2
IDPs rate age5	191	3.5	3 4
IDPs rate age6	146	12.3	10.6 14.1
IDPs rate age7	108	6.5	5.4 7.8

*Per thousand

Source: CODHES and DPS

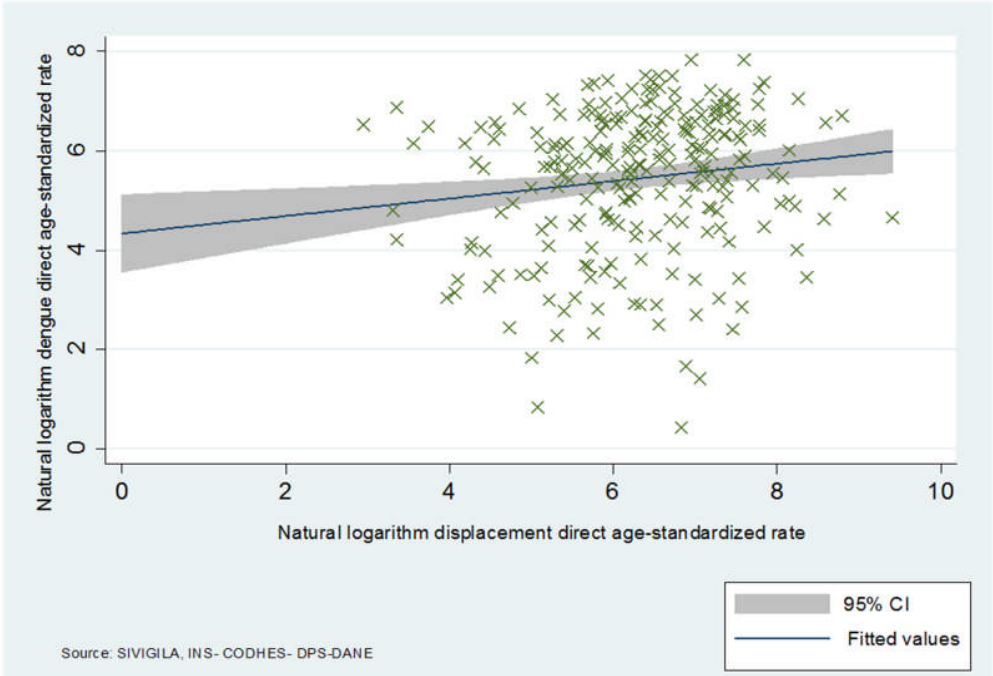
Pearson's correlation coefficient, which relies on data being normally distributed (parametric test) was used to assess the relationship between log transformed dengue and IDPs rates. Spearman's rank correlation coefficient, which does not rely on normally distributed data (non-parametric test) and estimates the differences between ranks[38], was also used. Figure 26 shows that log transformed dengue rates correlate with log transformed Internal Displacement rates. The Pearson's correlation coefficient was 0.179 (p=0.0048) and the Spearman's correlation coefficient was 0.19 (p=0.0021) both indicate a highly significant but weak correlation between levels of IDPs and dengue. It should be noted that a weak correlation is expected when the Perason's coefficient is used for testing

[38] Rank of sets of data (numerical or ordinal) is the corresponding value, for each data in the set, if the data would be organized in ascending order.

hypotheses in large samples. Also, this result is expected because Spearman's rank correlation does not measure the strength of the relationship.

Figure 26 Correlation dengue and Internal Displacement

Correlation logged dengue and IDPs age-standardized direct rate over 2 year-period (2010-11)



PEARSON (PAIRWISE) CORRELATION	ln of Age-stand. direct dengue rate*100,000	ln of Age-stand. Direct IDPs rate*100,000 +1
ln of Age-stand. direct dengue rate*100,000	1	
ln of Age-stand. Direct IDPs rate*100,000 +1	0.179*	1
p value	0.0048	
SPEARMAN		
Spearman's rho	0.1948*	
Prob > t	0.0021	

Predictor variables were organised in ordinal categories and their distribution in the 247 municipalities was explored. Figure 27 shows the differences among frequencies per each category:

Figure 27 Other predictor variables' frequencies

Description of other available relevant variables

		Frequency	Percentage	Cumulative
Ordinal temperature (n=247)				
1	10-19C	31	12.5	12.5
2	20-30C	199	80.6	93.1
3	31-38C	17	6.9	100
Ordinal altitude (n=247)				
1	0-1,000 m.a.s.l.	174	70.4	70.4
2	1,001-3,500 m.a.s.l.	73	29.6	100

		Frequency	Percentage	Cumulative
Pipe water ordinal (n=243)				
0	0-70%	16	6.6	6.6
1	71-89%	33	13.6	20.2
2	90-100%	194	79.8	100
Sewer system ordinal (n=247)				
0	0%	2	0.8	0.8
1	1-50%	25	10.1	10.9
2	51-80%	31	12.5	23.5
3	81-100%	189	76.5	100
Rubbish collection ordinal (n=246)				
0	0-50%	14	5.7	5.7
1	51-80%	28	11.4	17.0
2	81-100%	204	82.9	100

		Frequency	Percentage	Cumulative
Urban areas sizes (n=247)				
1	<100,000 inh	199	80.6	80.6
2	100,001-200,000 inh	22	8.9	89.5
3	200,001-1,000,000 inh	22	8.9	98.3
4	>1,000,000 inh	4	1.6	100

Source: DANE – Official municipality website

Municipalities with temperatures between 20-30°C and altitude below 1,000 meters showed having more dengue cases, as these environmental conditions are appropiated for dengue transmission (chapter two, section one). Other municipalities with lower temperatures and high altitudes are not areas with dengue vector presence. However, those municipalities are important because if they were reporting dengue cases might indicate that cases are arriving there from endemic areas (Chaparro et al., 2014). Moreover, dengue cases were more frequent in municipalities with domiciliary utilities coverage above 81%. Municipalities with pipe water coverage ranging between 90-100% reported

more dengue cases. Also, dengue cases were more frequently reported in municipalities with 81-100% of sewer system and rubbish collection coverage.

Aiming to assess which variables might confound the relationship between dengue and IDPs, the predictor variables were tested for associations with dengue and IDPs. In order to be a confounder a predictor variable would need to be associated with both dengue and IDPs. Associations were tested using IDPs and dengue age-standardized direct rates on the original scale. A non-parametric method, the Kruskal-Wallis one-way analysis of variance, was the most appropriate for comparing variances. In this case, the Kruskal-Wallis assess whether the median values (middle rank) of predictor variables are different from zero between pairs of observations from two groups (dengue and IDPs). In other words, if predictor variables have either lower or higher ranks when comparing them with dengue and IDPs. Chi-square was used to test significance of the results. The observations correspond to the municipalities included in the analysis. Figure 28 shows the results per each comparison:

Figure 28 Comparison of outcome and predictor variables variances

Kruskal-Wallis non-parametric test (DF and IDPs in original scale)

PREDICTORS (ORDINAL)	DENGUE FEVER	INTERNAL DISPLACEMENT
	Observations & Rank sum	Observations & Rank sum
• Temperature		
1	31 2,239.00	31 2,768.00
2	199 27,208.00	199 26,351.00
3	17 11,81.00	17 1,509.00
Chi-squared & p value	32.5 (0.0001)*	14.2 (0.0008)*
• Altitude		
1	174 21,241.00	174 22,677.50
2	73 9,387.00	73 7,950.50
Chi-squared & p value	0.4 (0.5132)	4.6 (0.0316)*
• Urban area sizes		
1	199 24,733.00	199 23,821.50
2	22 2,478.00	22 2,576.00
3	22 2,971.00	22 3,631.50
4	4 446.00	4 599.00
Chi-squared & p value	1.2 (0.7511)	8.7 (0.0334)*
• Pipe water		
0	16 1,667.00	16 2,487.00
1	33 2,011.00	33 3,957.50
2	194 25,968.00	194 23,201.50
Chi-squared & p value	31.4 (0.0001)*	3.9 (0.1440)
• Sewer system		
0	2 66.00	2 45.50
1	25 1,705.00	25 2,734.00
2	31 2,557.00	31 3,887.50
3	189 26,300.00	189 23,961.00
Chi-squared & p value	37.5 (0.0001)*	5.4 (0.1470)
• Rubbish collection		
0	14 715.00	14 1,446.00
1	28 2271.00	28 2,805.00
2	204 27,395.00	204 26,130.00
Chi-squared & p value	29.1 (0.0001)*	4.9 (0.0827)

Source: SIVIGILA, INS –CODHES –DPS – DANE – OFFICIAL MUNICIPALITIES WEBSITE

For dengue the higher ranks were related to the variables pipe water coverage (90-100%), sewer coverage (81-100%), and rubbish collection (81-100%), whereas altitude (0-1000 m.a.s.l) and large-size cities have the higher ranks when examining IDPs. Higher ranks of the variable temperature (20-30℃) were found for both dengue and IDPs. These results were significant which might indicate that there are a relationship among the predictor variables, and dengue and IDPs.

Explanation of findings

The previous charts show how more developed urban areas within municipalities tend to have higher dengue rates. As stated in this document, this finding is influenced by people's water usage and the amount of containers holding water. As previously mentioned, a good utilities' coverage (piped water, rubbish collection, and sewerage) was related to dengue rates, but was not significantly related to IDPs rates. A possible explanation for this is that in urban settings with good piped water coverage, dengue vector can breed in any clean water container. It might be also possible that dengue rates are related to areas with good utilities network because its vector is currently able to complete its lifecycle within human households. Anoher possible reason is that dengue could be reported more frequently in areas with good infrastructure where there are hospitals with better equipment and diagnostic tests. Altitude and city size were related to IDPs but not to dengue, and this might be explained because IDPs tend to move from rural areas to the nearest urban areas. Many of these urban areas are located in low altitudes. In addition, finding dengue related to large urban areas might be explained because IDPs find more aid there. Temperature was associated with both dengue and IDPs, and this is an indicator that temperature could have a potential interaction effect in dengue (because temperature modulates the transmission of dengue in endemic areas), and a potential confounding effect for IDPs in this study (because temperature does not have a causal effect in forced migration due to conflict). However, the temperature could have another relationship with forced migration due to climate change.

In summary, these preliminary ecological analyses have confirmed that municipalities with higher levels of IDPs have higher levels of reported dengue although the correlation is weak. Further analysis, will consider temperature effect in dengue and IDPs due to conflict, as well as in the relationship of both events. Rainfall should be also considered in further models, because it leads to artificial water-filled containers in public spaces. Therefore, rainfall might have a similar role in the relationship of dengue and IDPs as temperature.

Final words

In this chapter, a geographical analysis was used to inform other epidemiologic assessments of the relationship of dengue and Internal Displacement in Colombia. Then the epidemiological analysis of national data pointed out that dengue correlated with Internal Displacement, but also that the correlation is weak so that other determinants should be explored. Then, it seemed pertinent to conduct a study in an endemic area to explore more determinants in depth. In the next two chapters, the information obtained from fieldwork in an endemic urban area in Colombia is provided. A detailed section of methods, a summary of socio-demographic information about non-displaced and IDPs participants, and a description of findings obtained through qualitative and quantitative methods are presented.

Chapter 6: Results from fieldwork in Colombia part 1

Statement of authorship

I carried out the work presented in this chapter. The collaboration with the Centro de Estudios e Investigación (CEIS) - Fundación Santa Fe de Bogota provided the infrastructures in the field to develop my project in safe conditions. Information of surveyed non-displaced households was obtained from CEIS datasets. CEIS also shared with this project the instrument for applying the surveys in IDPs households.

This chapter present the information of the fieldwork undertaken in Colombia. In section one, the information about the selected study place and information of methods applied there is described. Then, in section two, findings about water storage and use in participant households is provided.

Chapter 6, Section 1: Detailed methods

Study site characteristics

The city of Armenia is located in Quindío state, in one of the Andean ranges, and in the region known as a 'coffee production area' (Martínez Rubiano, 2009). In 2013, Armenia's population projection was 293,614 and sex distribution shows similar numbers of females (51.8%) and males (48.2%); according to ethnic groups the population was distributed in mestizos (96%), afro-descendants (3.4%) indigenous (0.6%), and ROM-gypsies (0.005%). According to the Colombia socio-economic stratum, 24% of Armenia population is classified in stratum 1, 24% in stratum 2, and 30% in stratum 3. The Gini index for 2013 was estimated in 28.4%. The healthcare indicators in 2013 were: 100% of coverage to people, who have the right to access the subsidized regime, and 96.8% of coverage of the general population. In regards to healthcare providers, Armenia had in 2013, fifteen institutions for healthcare provision (IPS) officially registered, 455 doctors in medicine (1.55 per 1,000 inhabitants) and 131 nurses (0,44 per 1,000 inhabitants) (Departamento Nacional de Planeación, 2013). In Colombia, for 2013 there were 1.77 doctors per 1,000 inhabitants and 1,04 nurses per 1,000 inhabitants (Organisation for Economic Co-operation and Development, 2015). It should be also mentioned that Armenia recorded an earthquake of 6.4 grades in Richter scale occurred on the 25th January of 1999, which affected severely the city. At least 75% of its inhabitants suffered any type of damage (e.g., physical -including death and disabilities, or structural damaged in their households and business) as a consequence of the earthquake (Periodico El Pais, 2014). This event is important in this research, because it is hypothesised that the economic aid that was given

for the restoring the city might have influenced the pattern of migration from and towards the city (Camargo and Jaramillo, 2011, Valencia-Barrera, 2000).

Methods applied in fieldwork

A description of the methods applied in fieldwork is given below. First at all, the qualitative approach is summarized, and second, the quantitative one. Third, the integration of qualitative and quantitative results is explained.

Qualitative approach

Overview of sources, collection and type of information used

A range of qualitative techniques was applied in this phase including field note-taking, semi-structured interviews, discussion and focus groups. In all of them the same categories were included in order to systematically collect the information. Three different types of questionnaires were applied to community members, public health practitioners and health authorities, and people working with Internal Displaced People (IDPs). Community members' interviews included categories such as fevers, water usage, relationship between fevers and water, mosquitoes as vectors of fevers, relationship among fevers, water and mosquitoes, and relevance of dengue fever in the community.

Specifically for public health workers and health authorities interviews asked about the application of World Health Organization guidelines and strategies for tackling dengue, the application of national regulations and guidelines, the application of local dengue prevention and control programmes, and the role of community strategies for tackling dengue. Furthermore, the study included questions about the activities for tackling dengue developed with vulnerable populations such as IDPs. For people working with IDPs, categories included were the characterization of IDPs in Armenia, areas and type of

settlements where IDPs were located in Armenia, main policies regulating Internal Displacement in Armenia, knowledge about dengue prevention and control programmes, and acknowledgement of community strategies for tackling dengue among IDPs and other vulnerable populations.

Informed consent was obtained before doing the interviews; also, participants were asked for permission to record the interviews. Once, the interview recordings were obtained, they were reviewed and checked to ensure anonymity and confidentiality. Then, interviews were transcribed and stored in ®Microsoft Word files. A preliminary framework analysis was done in order to review information, classify it into the pre-established categories and check the emergence of new categories.

Processes for reaching IDPs in Armenia

In order to reach and work with communities in Armenia, public engagement skills were used (See Figure 29). I organized several meetings with different local authorities aiming to discuss the best way to reach vulnerable populations and to know where they were located. Furthermore, in those meetings we discussed topics such as safety, security and confidentiality.

Figure 29 Public engagement strategies applied in fieldwork

(Author's own, 2015)

Once the neighbourhoods and informal settlements most affected by Internal Displacement were identified, other public health workers and I visited those areas for geo-referencing and locating settlements manually on a map of Armenia. It should be noted that IDPs information is protected by several Colombian laws; therefore it was not possible to access addresses or names of community leaders. However, the local authorities were working with indigenous populations (which are also IDPs) and they offered to help me to work with them first. So, meetings with indigenous authorities and leaders were set and I

explained the PhD study to them; once my PhD study was accepted, I started to work with them and visited some of the indigenous settlements in Armenia. Moreover, I reviewed the local indigenous population census obtained from indigenous authorities in order to have an idea of the size of this population and to think of the best ways of sampling indigenous households.

In order to not only have information about indigenous populations, I organized a new set of meetings with people from the Mayor's office who were working with IDPs aiming to reach complex IDPs (e.g., recent displaced people, people living in governmental hostels, people living in informal settlements). Because of the confidentiality and safety of IDPs, I was asked to provide the letters of collaborators in Colombia introducing my PhD project and myself. Eventually when all the documents and my credentials were reviewed, I was authorized to contact and meet some of the Internal Displacement community leaders; some leaders agreed to meet me in the Mayor's office and others in their homes. I explained to them what my PhD project was about and the relevance of it for the IDPs living in Armenia; finally the majority of the leaders agreed to collaborate with me. Then, I went with them to the hostels, informal settlements, or specific households were I could reach IDPs for working with them. A similar process but with less security steps was done for reaching host populations and inviting them to the focus groups; then, snowball sampling was performed and meetings with community leaders, working in partnership with the government, were conducted. After explaining what this PhD project was about, the leaders agreed to invite me to their regular meetings with the community.

Information collection and analysis

Two focus groups were done among non-displaced populations, and six focus groups and two discussion groups were done among IDPs. I decided to run this amount of groups because I had reached the saturation point for the information I needed to collect. Finally, meetings with health authorities, indigenous authorities, and community leaders were set aiming to present to them the preliminary results of phase three, and to receive feedback from authorities and leaders in order to include it into the analysis.

A participative diagnosis technique (Geilfus, 2008), designed for people to describe their own point of view in regards to a certain program, policy, or strategy, was applied in one of the discussion groups and two of the focus groups. The aim of applying this technique was people to express their relationship with water in the city of Armenia through drawings. In addition, IDPs suffering recent Internal Displacement [39] were asked to draw the relationship between them and water in the places they lived before the forced displacement.

Interviews were transcribed and a preliminary analysis with pre-established categories was done manually during fieldwork; the analysis of the framework helped to identify whether the saturation point was reached, to classify information according to categories, to identify emergent categories, and also to have data about Internal Displacement in Armenia in order to identify potential participants. Then, back in a second analysis was performed in the qualitative package ®AtlasTi using transcripts and other documents collected in the field.

Quantitative approach

Overview of sources, collection, and type of information used

Sampling

A cross sectional study was applied in Armenia, and two different types of sampling were used; firstly, a cluster-randomized sampling from a larger study was used. In this large study led by CEIS (Higuera-Mendieta, 2012), a grid was used to divide the Armenia map, and then 20 squares were selected randomly. In each square they would be 100 houses next to each other and all of the households were included in the sample. Therefore, a total

[39] In chapters six and seven, a distinction between IDPs suffering long-term and recent Internal Displacement (in this research, IDPs who were reached through governmental institutions) is established to highlight certain differences among them. However, this distinction was not considered in the quantitative analysis.

of 2000 households distributed across the city of Armenia were the sample of the CEIS study.

Secondly, public engagement (see Figure 30) and snowball sampling were used to select IDP households. The number of IDPs households for applying the survey was selected assuming that hypothetically 2000 controls (non-displaced households) would be included. Although my PhD study would not gain much extra power when there were more than 3 or 4 controls (non-displaced hosueholds) per case (IDPs' households). So, in this hypothetic scenario if my study would have included 50 IDPs households and 2000 controls, it would have a power to detect 1.66 fold difference in a binary outcome 30% vs 50%. However, if my study included 100 IDPs households and 2000 controls it could detect a 1.5 fold difference in a binary outcome of 45% vs 30%, which seemed to be more realistic. Therefore, 105 IDPs households were included and 315 non-dispalced households (3 times 105 of IDPs). Given that there were some problems downloading the information of the households from the electronic dataset, it was decided to have 10 more non-displaced households and that is why the final sample of non-displaced households was 325. The IDPs households were matched with non-displaced households according to the Colombian socio-economic stratum classification[40]. The proportions of non-displaced households were selected in the following way:

- Stratum 1 45%
- Stratum 2 53%
- Stratum 3 2%

This selection considered that the IDPs sample included both recent and long-term IDPs and those were the proportions of IDPs participants included in the first round of interviews done in indigenous households.

[40] The classification by stratum classifies people's households according to the physical characteristics of their home, surrounding environment, and location in urban and rural areas. The strata are homogenous within it, but heterogenous in comparison to the others. The classification ranges from stratum 1 (lower) to stratum 6 (higher). ALZATE, M. 2006. La estratificación socioeconómica para el cobro de los servicios públicos domiciliarios en Colombia ¿Solidaridad o focalización? Santiago de Chile: Naciones Unidas.

Informed consent was obtained from all the households before applying a Knowledge, Attitudes and Practices (KAP) survey. The KAP survey used contained three different sections:

1. Geographical and demographical information

   This section contains information about household location within the neighbourhood; as well as, gender, sex, ethnicity, education level, and occupation details of the surveyed people.
2. Individual level information

   This section contains information from the surveyed people about healthcare affiliation, migration, and family composition. Furthermore, the section contains information about knowledge, attitudes, and practices towards dengue, as well as, water usage and storage.
3. Household level information

   This section contains information about the household socio-economic conditions and building materials, and amount of water-filled containers (see Appendix 4) and mosquito counts within the households.

Information collection and analysis

A bar code was assigned to every household and this corresponded to the household's identification code. This code was used in the three different sections of the survey; water tanks and containers found within the household were documented with a specific bar code linked to the household identification code. In addition, a list of codes was compiled to verify that codes were linked correctly. Lastly, surveyors scanned the bar codes and captured all the information electronically on mobile phone devices which sent the information directly to a dataset located in a server.

Fortnightly reviews of the dataset were conducted in order to establish whether the information had been stored correctly; then, the data was extracted and exported to three different Microsoft Excel files according to the sections of the survey. Information of 8 IDP

households did not migrate from the device to the dataset; several reviews were done both to the dataset and the devices, but it was not possible to recover that information. The three ®Microsoft Excel files were transformed to CSV files and information was imported to ®STATA program; translations of the variables, data management, and analysis of data were also performed in ®STATA.

In other to understand the statistical analysis applied in this chapter, two main features of distribution of containers, and mosquitoes within households. First, containers within households have a normal distribution which could be analysed with parametric statistics. Second, the vector distribution in containers and households is different to normal which might need to be analysed with non-parametric tests. Efficiency of a certain type of containers is defined as the pupal productivity of those containers divided by the prevalence of the number those containers (Hammond et al., 2007) .

Integration of results

After obtaining results in phase three and performing a preliminary framework analysis, emergent categories were identified and analysed. This analysis helped to understand how best to identify survey participants for phase four. Results were integrated in a second analysis applying the technique 'following a thread' (O'Cathain et al., 2010); in other words, some of the key themes obtained from phases one and two, were explored in phase three, and contrasted within the analysed data from phase four.

Chapter 6, Section 2: Socio demographic characteristics of participants and health system barriers

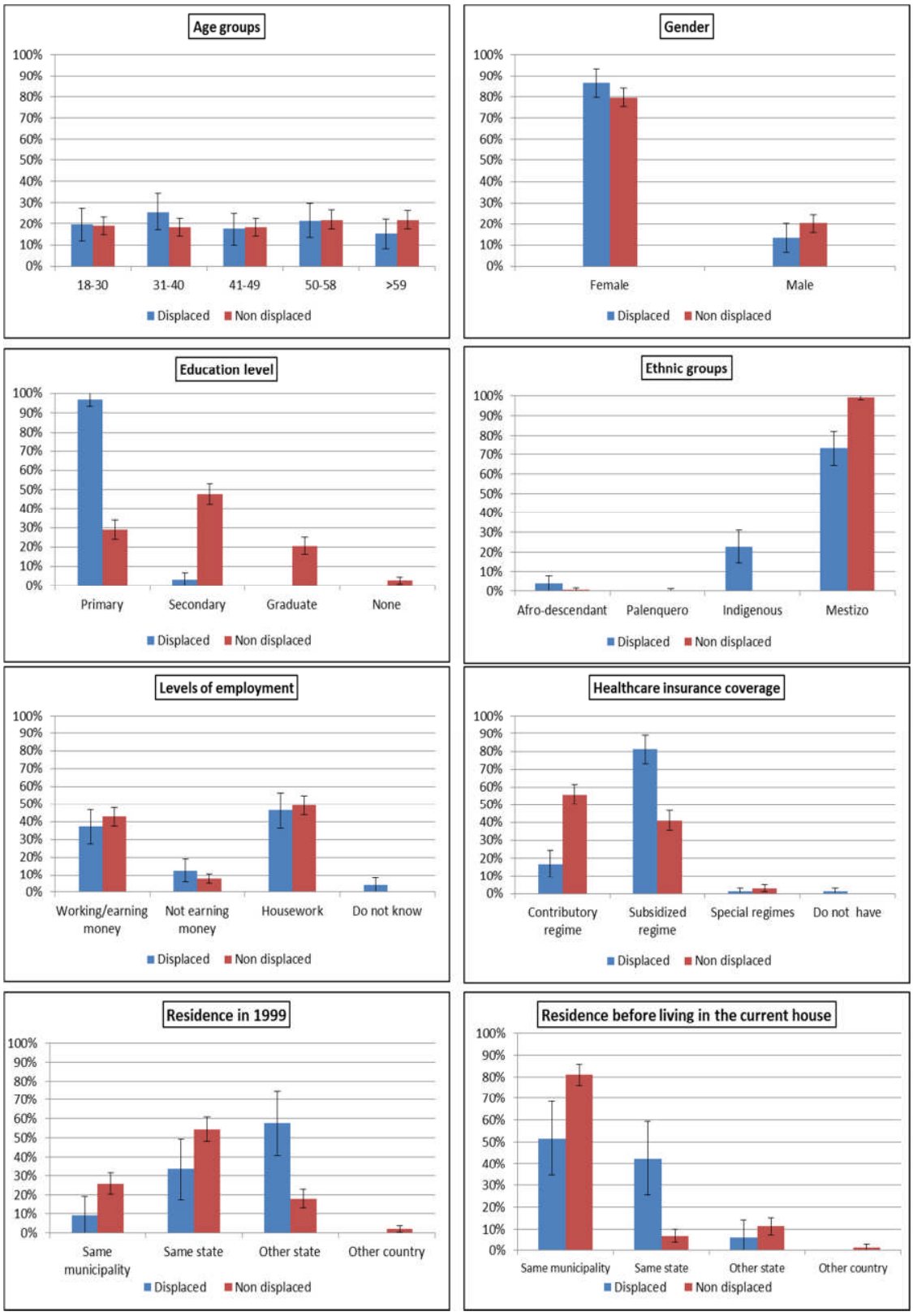
In this section, a description of socio demographic findings of IDPs and non-displaced people are given; as well as, a description of Internal Displacement main features in Armenia and also IDPs' healthcare services provision in that city. Mixed results are integrated and a discussion about the main findings is provided.

Results

Individuals' description

A total of 105 displaced households were chosen to participate, however 8 households could not be included. So, a total of 97 IDPs households and 325 non-displaced households were included. The populations did not show differences in age distribution, the average age was 44 (SD=15), and women were more likely to respond to the survey than men (female: male ratio of 4.3:1). Nearly 50% of those surveyed classified their occupation as housework, and displaced and non-displaced participants had similar levels of employment (See Figure 30). These results suggest that participants are similar regarding age distribution, gender and main occupation; participants from both populations are female young adults in charge of housework. Ethnicity showed a significant difference between the two groups; almost 26.8% of IDPs had afro-descent or were indigenous members compared to none of the non-displaced. These findings suggest that displaced participants could be more vulnerable to migrate or not settle permanently because of their ethnic roots. Regarding educational level, although all IDPs surveyed had some level of education, only 3% had secondary level, and none had a graduate level, the majority of them have just primary studies. Among non-displaced population 97% of them have some level of education achieved, and 76% of them have secondary studies (See Figure 30).

Figure 30 Main demographic, social, and economic variables comparison between IDPs and non-displaced



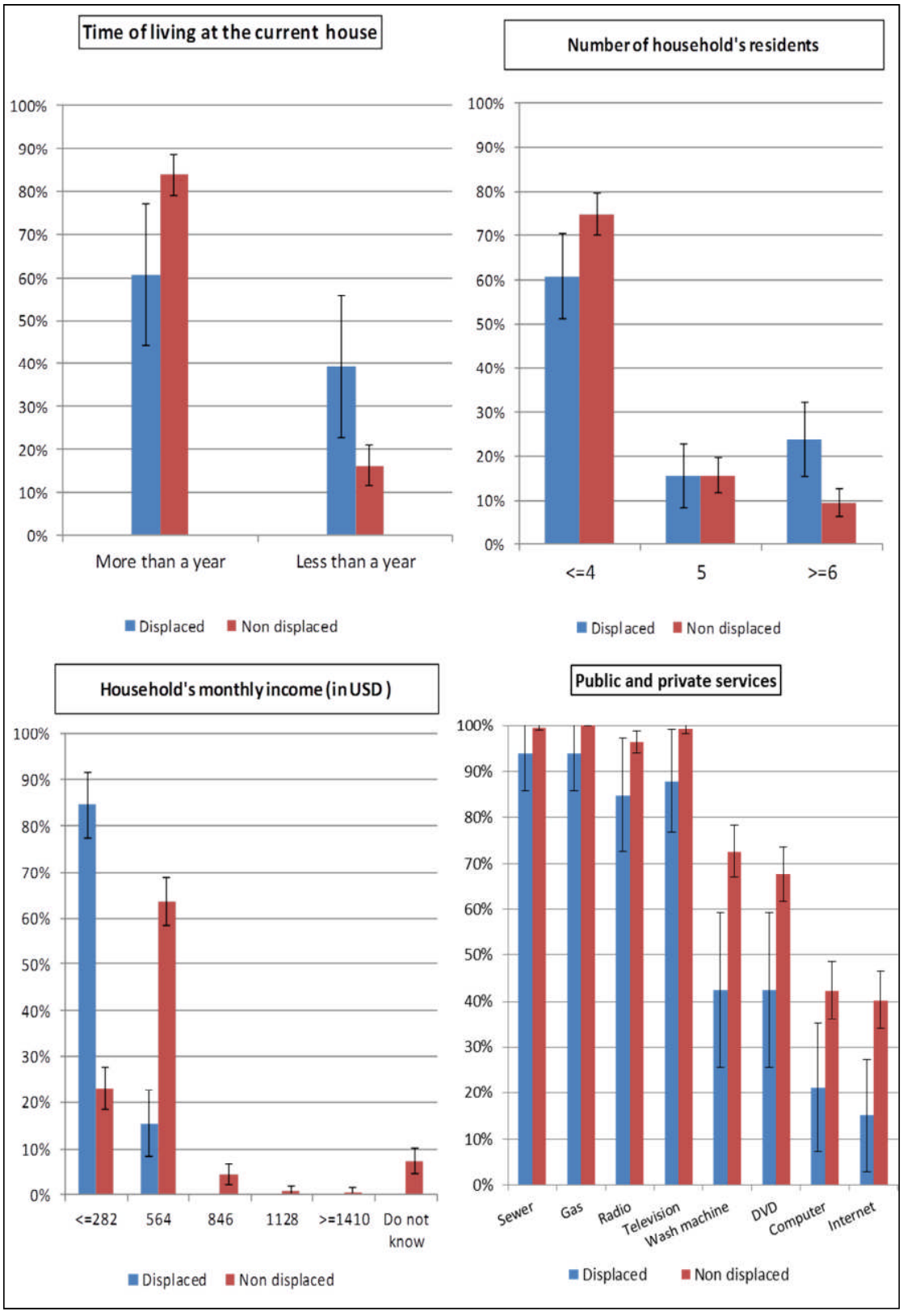
Households' description

Figure 31 displays household variables explored among participants. Nearly 60% of IDPs households had been living in the same house during the previous year before the survey's start date, in comparison with 84% of non-displaced households. One member per household was a rare finding (6%) in both populations, and more than half of the surveyed households had 4 or fewer members. However, the number of IDPs households with more than 6 members was three times more than the same number in non-displaced households. Qualitative analysis pointed out that whether IDPs were indigenous or not and suffering long-term or recent displacement influenced their way of living within households. The majority of indigenous-IDPs and recently displaced lived as a community; in other words, the household was composed by more than one nuclear family. In some of these households a family shared a room (≅ 5 people). In general, IDPs suffering long-term displacement households had one nuclear family, as well as, other relatives such as uncles, aunts, cousins and grandparents. Moreover, the vast majority of households in both populations did not have more than double the minimum Colombian wages[41] as a monthly income, but 88% of IDPs households reported a total household income at or below the minimum Colombian wage compared to 25% of the non-displaced population.

Electricity and rubbish collection service coverage was 100% in both populations; whereas the coverage of sewer services was 100% in non-displaced households, and less than 95% in displaced households ($p<0.005$). IDPs households had a similar coverage of natural pipe water than non-displaced. More than 80% of households in both populations have a radio and television, but the number of non-displaced households with other appliances and services was double the number of IDPs ones.

[41] In 2013, the minimum legal Colombian wage was approximately USD $ 282 per month.

Figure 31 Relevant economic and social variables at the household level



Neighbourhoods' description

This study included eight neighbourhoods where IDPs were living and were legal settlements. In addition, three illegal settlements where IDPs where located were also included. The majority of the neighbourhoods were located in the southwest or the centre of the city, although one was located in the north. The majority of these neighbourhoods were located within the city, while the illegal settlements were located in the peripheries. Moreover, many of the settlements, either legal or illegal, were located near small rivers, and some of these rivers had problems with their water quality (Muñoz-Londoño, 2014, Bueno and Restrepo, 2013). Likewise, there was not a good management for disposing the rubbish in some of these neighbourhoods. Furthermore, the illegal settlements located in peri-urban areas still had some characterisitics of rural areas. The houses located illegal settlements vary greatly and they were made of wood, bamboo, or bahareque[42], and plastic to cover the interiors of the houses. The roofs were mainly made of zinc sheets, and the floor in few cases was made of cement. In other neighbourhoods, the houses were made of cement and brick for the interiors, had one or two-storey, and the majority had a '*patio*' (courtyard). Some of the houses with two-storey had also a terrace. The majority of the neigbourhoods had good ways and were well connected to the city; however, the illegal settlements were located in areas with difficult accessibility. IDPs' jobs were located, in the majority of the cases, in the centre of the city, and healthcare centres where IDPs could access were located mainly in the south of the city.

Non-displaced neighborhoods were legal settlements included in the Territorial Organization Plan (POT) of the city. The neighbourhoods selected for this study where located mainly in the centre or the southwertern part of the city. Some of these neighburhoods had been re-built after the earthquake of 1999 (Ramirez, 2013), and this situation influenced the housing design in Armenia; for instance, many of the houses in those neigbourhoods lack the '*patio*' (courtyard). In general, the neighbourhoods are well connected with the city and have good ways. In general, the location of non-displaced people's jobs is the centre of Armenia. In addition, depending on the economic conditions

[42] Material composed by an interwoven of caine or sticks mixed with clay.

of the households, non-displaced people could access the same healthcare centres as IDPs (in the south of the city) or some located in the north.

Migration status

Among IDPs interviewees just 13% of them were born in Armenia and 24% in Quindío state whereas for non-displaced participants those percentages were 46% and 59% respectively. In 1999, 22% of IDPs were living in Armenia and 55% were living in Quindío, but by 2011 60% of the IDPs were living in other states different to Quindío (See Figure 30). These data indicate that the minority of IDPs were originally from Armenia and Quindío, but by 1999 (when the earthquake occurred) more than the half of the IDPs were already settled there.

Moreover, IDPs had their own opinions about the Internal Displacement process and consequences in Armenia:

> *For some of us, the [indigenous] people, authorities and communities, the territory is relevant, and [it] is part of the process that we are experiencing. The majority of us, we are [living] in different states [which are not] the ones we had been born; [we have migrated] because of hard situations like the [internal] displacement which [also have different] causes such as the loss of our territory; our territory in our states of origin had been reduced, but the community grew and we were forced to migrate to other place... In these new places we do not have a smallholding, but if we had one we could cultivate our own food and we could have our food standards, and we would not have problems such as malnutrition* [sic] (Participant 1, IDPs Focus group 1, Armenia, 2013).

IDPs have had to adapt themselves to the conditions offered in the cities and deal with new conditions that they were not used to before; some of those conditions are exemplified by two men in the same focus group:

> P1: *So, now we need to buy our food*
> P2: *Excuse me, but before buying the food I need to think how I going to earn the money for buying the food, and here in Armenia there is a lack of unemployment*
> P1: *Lack of employment*
> P2: *Sorry for my mistake, lack of employment, lack of jobs, [lack] of opportunities for working, [lack] of opportunities for indigenous communities to be included [in the society]; that is why you see so many indigenous people begging for a coin... How great it would be if we took all of these indigenous people and return them to the countryside, to work [the land]... Then we would not talk about malnutrition or poverty, because we were working for our own salary and our own food* [sic] (Participant 1 and Participant 2, IDPs Focus group 1, Armenia, 2013)

IDPs opted to organize themselves in different associations and not-for-profit Non-Governmental Organizations (NGOs); IDPs associated with other citizens seeking to keep IDPs together and to provide them humanitarian and legal aid. The associations and NGOs found in this research among both IDPs and host populations are summarized in table 12:

Table 12 Community associations in Armenia

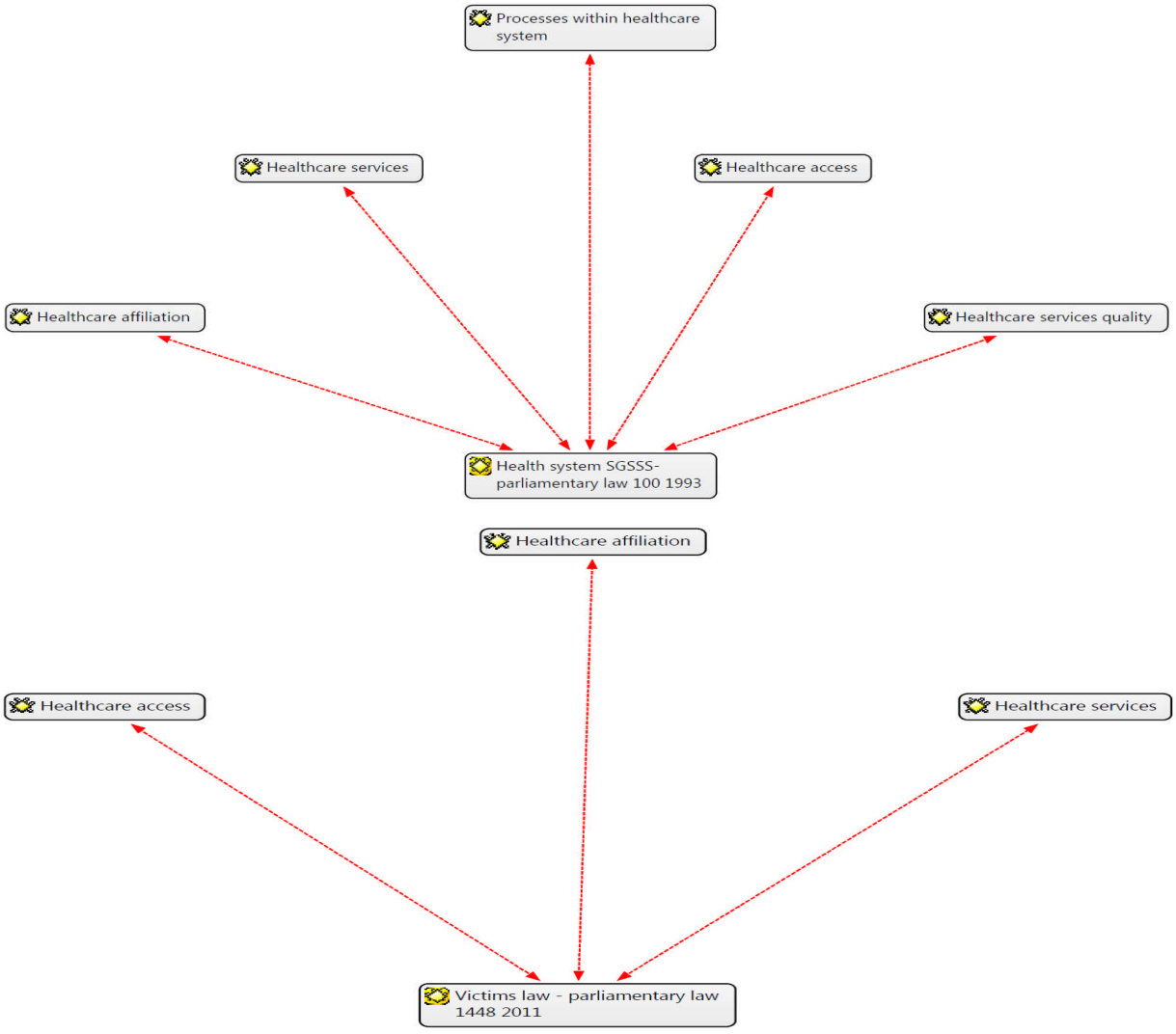
Population	Community associations, groups, and partnerships	Total
IDP	Non-indigenous associations	5
	Indigenous associations	2
	Partnership between neighbours association and government with IDPs members	1
Non-displaced	Partnership between neighbours' association and government (official data)	237
	Partnership between community's nurseries and government	3

(Author's own, 2015)

Healthcare services

As mentioned before in chapter two, section two, the Sistema General de Seguridad Social en Salud- Colombian Social Protection System (SGSSS-law 100/1993) should cover all of the Colombian population and assure the inclusion of vulnerable populations (such as peasants, indigenous populations, and ethnic groups), or populations who are unable either to reach the labour system or to pay a health insurance. However, with the emergence of the Internal Displacement mainly affecting these populations, the government could not accomplish the goal of affiliating them to the SGSSS. Therefore, the legal framework for IDPs indicates the mechanisms for IDPs' affiliation, accessibility to services, and provision of good quality services within the SGSSS. According to the Victims law -law 1448/2011 (chapter four) it is mandatory that all IDPs will be affiliated to the SGSSS through the subsidized regime, except in the case that IDPs have enough economic resources for affiliating themselves (See Figure 32).

Figure 32 Intersections between laws 100/1993 and 1448/2011 addressing healthcare provision



The KAP survey revealed that the number of displaced people affiliated to the subsidized regime was double the number in non-displaced people. Only 17% of displaced people were affiliated to the contributory regime in comparison with 56% of non-displaced people (See Table 13). However, when this variable is explored among men and women from both groups, men are more likely to be affiliated than women to the contributory regime (male female ratio of 1.3:1), whereas the opposite results are found for the subsidized regime (See Table 13). Furthermore the results showed the difference between sexes when

obtaining one or other type of health insurance; in both populations women are less likely to reach the contributory regime.

Table 13 Distribution of healthcare affiliation by gender

Healthcare insurance	Female (%)	Male (%)
Total participants		
Contributory regime	44.4	56.7
Subsidized regime	52.8	41.9
Special regimes	2.8	1.4
No insurance	0.3	0.0
IDPs		
Contributory regime	15.8	23.1
Subsidized regime	81.7	76.9
Special regimes	1.2	0.0
No insurance	1.2	0.0
Non-displaced		
Contributory regime	53.9	63.9
Subsidized regime	42.8	34.4
Special regimes	3.3	1.6
No insurance	0.0	0.0

According to Victims law -law 1448/2011, it is expected that IDPs in spite of their type of affiliation, gender, age, ethnicity or place of settling can access the SGSSS and Accident & Emergency services across the country and enjoy good quality services (Ministerio del Interior y de Justicia, 2011); however, this research found that IDPs participating in this study had faced barriers precisely in those aspects. Participants' healthcare barriers are summarized and classified in Table 14.

Healthcare services' barriers described by respondents

People mentioned as access barriers the prolonged waiting times for seeing a doctor:

> *[It] is about waiting because if you have dengue, and [you] go to the health centre, and then [you] wait there 2 or 3 hours, it is better [for you] to go to your house or to look for the traditional doctor who sees [you] quickly and who gives [you] easily the treatment* [sic] (Interviewee 1, working with IDPs, Armenia, 2013).

Furthermore, people felt that they are wasting time and money:

> *For being seen [by a doctor] in a health centre, they [doctors] need to see [you] dying; otherwise, you go to waste your time, [and] to lose the money of the [bus] ticket* [sic] (Participant 1, IDPs Focus group 2, Armenia, 2013).

Other people considered that their migration status constitutes a barrier itself:

> *We were asking for an ambulance, [for] a transport for the community; [because in case] we [have an] urgency we need to take the sick person [to the hospital]... But overall this problem is here in Armenia because we [have been] not brought up here, so we [are] mistreated... and they [the government] has forgotten that we, the proletariat, need help* [sic] (Participant 1, IDPs Discussion group 1, Armenia, 2013).

People also faced access barriers because they did not know the distinctions that insurance companies had established to provide their services:

> *For instance, people from my community and I go to the health centre for dentist's appointments, [but] when we have a fever or stomachache we treat them with plants. So, for something that is out of our hands, [for instance] if the fever does not cease, we go to the health centre and then they [doctors] send us to the hospital. Many times you go to the hospital first, and they [doctors] say [to you] go first to the health centre, so you do lots of turns [commuting from one place to another] and then your disease is worst* [sic] (Participant 3, IDPs Focus group 1, Armenia 2013).

People mentioned as a barrier the lack of savings for emergencies, in case they need to commute long distances for accessing healthcare services:

> *We need to save little money even if we earn a little salary; [if you do not do that] when [you] are in need or sick, you do not have money to pay a taxi. So, that little money [helps] you to pay the taxi for commuting wherever you go, or wherever they [doctors] send you* [sic] (Participant 2, Discussion group 1, Armenia, 2013).

People described other barriers like the scarcity of doctors' appointments and doctor's misdiagnosing (poor quality of services):

> *I guess that the majority of the people do not go quickly to the doctor, [they] go when [it] is an emergency because the majority of the people do not like to go to the doctor...because [in the health centre people] need to wait [for an appointment] or they [doctors] say [people's problem] is not an emergency and for people it is an emergency. That is why people prefer to treat themselves and only go to the hospital for emergencies* [sic] (Interviewee 2, working with IDPs, Armenia, 2014).

I also found that IDPs had been both interposed legal actions and mobilized themselves for receiving good quality services. Particularly, indigenous populations in the city of Armenia have gained spaces for participating both in the political arena and also in accessing the SGSSS. However, some people did not consider this increase in human resources was enough for covering the needs of the population:

> *There are two [indigenous] nurses looking after the indigenous population here in Armenia, and for them [the two nurses] it is difficult to see all the indigenous population. It is an achievement to have two nurses destined to [work] with indigenous population, but for them [the nurses] is too difficult to come every day [to people's houses] and to do everything* [sic] (Interviewee 1, working with IDPs, Armenia, 2013).

The following table summarizes described barriers and classifies them, according to the categories described by Abadia and Oviedo (2009) and Ormond (2013):

Table 14 Barriers described by participants and classified them in six categories

Barriers described by participants	Category 1: Administrative problems with the insurance-based system	Category 2: Economic barriers	Category 3: Institutional deficiencies	Category 4: Entitlement to access healthcare	Category 5: Discriminatory practices	Category 6: IDP status
Prolonged waiting times			X			
Wasting time and money		X				
Migration process				X	X	X
Distinctions in the provision of healthcare services	X					
Lack of savings destined to emergencies		X				
Poor quality of services			X			
Lack of human resources			X			

Author's own elaborated with data collected from participants –Categories are adapted from (Ormond, 2013, Abadia and Oviedo, 2009)

Discussion

Summary

This section describes socio demographic characteristics of IDPs and non-displaced people living in Armenia. Populations were matched on geographical areas, which share the same Colombian socio-economic stratum. In spite of the matching process IDPs showed much more deprivation of social conditions; they were more likely to belong to ethnic minority groups, had much more informal jobs, had much lower educational level, were much more likely to be living below the minimum wage, and lived with more people per house. Although, displaced people recognized themselves as forced migrants and are aware of their rights, they face disadvantages for accessing healthcare services in comparison with host populations. Usually displaced people arrive to the vulnerable areas of a city and live with the urban poor. Ruíz-Ruíz (2008) stated that the vulnerability produced by the migration process itself might lead to worse socio-economic conditions of displaced populations, as well as to wellbeing's deterioration of the host populations. The results of this chapter are consistent with Ruíz-Ruíz (2008), because they reflect the vulnerabilities that a displaced person faces in comparison with urban-poor in spite of living in the same socio-economic stratum.

Explanation of findings

In general, women were much more likely to be surveyed than men; this may reflect higher numbers of women living without men or could be because men were out of the house working. Nevertheless, several authors have affirmed that amongst displaced populations adult women survive while men die, given that men tend to be more involved in conflict and violent episodes. Furthermore, this sub-study found that there are more people from ethnic minorities among displaced population than among non-displaced population. Hernández-Bello and Gutierrez-Bonilla (2008) found that displaced people settled in Bogota were 10 times more likely to belong to an ethnic group in comparison with non-

displaced people. Although, establishing the Colombian ethnic minorities-IDPs counts is difficult[43], some authors have agreed that ethnic groups are severely affected by Internal Displacement especially afro-descendants and indigenous groups (Bello, 2004, Consultoría para los Derechos Humanos y el Desplazamiento, 2011a). In 2012 a total of 1230 people were displaced in the Andean region, where Armenia is located, and 90% of those displaced people belonged to ethnic minorities groups; some of these recent displaced ethnic people were included in this study.

Moreover, IDPs participants showed a tendency to not reach high levels of education in comparison with non-displaced participants; in this extent Hernández-Bello and Gutierrez-Bonilla (2008) considered that displaced people did not reach the same educational level as non-displaced people. Another study (Barceló Martínez, 2007) conducted between 2002-2003 in 6 cities showed that 60% of displaced people had primary studies, only 18% secondary studies, and less than 0,5% graduate studies. For non-displaced people those percentages were 54%, 33% and 1.5% respectively. Two reasons could explain these findings: firstly, displaced populations face disadvantages studying even before commencing the forced mobilization; because they come primarily from the countryside where possibly they reach primary studies. In the Andean region, illiterate people from rural areas represent 10% of the population which is almost double the percentage of people living in urban areas (Departamento Administrativo Nacional de Estadística, 2014). Secondly, when arriving to cities displaced people face disadvantages for attending school; displaced people need to have a legal migrant status, awarded by the government before accessing the education system.

This research found differences among displaced and host participants in the opportunities to have a job and a labour income. Moreover, Hernández-Bello and Gutierrez-Bonilla (2008) found that displaced populations were 1.4 times more likely nor to have a job and not to obtain benefits in comparison with non-displaced populations. Among those who have a job, displaced people were more likely to have informal jobs than non-displaced

[43] Until 2013, when the Colombian government recognized the official numbers of Internal Displacement, the counts of displaced people were provided by different sources with disagreement in their numbers.

populations. Hernández-Bello and Gutierrez-Bonilla (2008) stated that low levels of formal employment, high prevalence of informal jobs, and lack of opportunities for obtaining benefits do not allow IDPs' households to reach the same total monthly income as non-IDPs' households which could explain the results found in this research. Furthermore, Barceló Martínez (2007) found that 42% of displaced people did not have an activity allowing them to earn money in comparison with 39% of non-displaced people, and from those who could work, 19% of displaced people and 25% of non-displaced people had a formal job. Hernández-Bello and Gutierrez-Bonilla (2008) and Barceló Martínez (2007) have suggested that the differences in educational levels and occupation do not allow IDPs to achieve a formal job in comparison with non-displaced populations. In addition, Ibañez and Moya (2010) compared two groups of IDPs in Colombia; one group receiving benefits from a cash-transfer program and the other group without any economic aid at all. The authors found that the rates of unemployment between beneficiaries and non-beneficiaries after 3 months of settling in the host place were 33.3% and 54.2% respectively. After one year of settling, the rates of unemployment were 10.4% for beneficiaries and 16.2% for non-beneficiaries; the authors suggested that the Internal Displacement and the conflict shock led IDPs to be more vulnerable and poor in host places, in spite of the economic aid, because they could not both join easily the job market and earn enough income to cover their needs.

Regarding household's characteristics, this research found that the average number of people living in a household was 4.3 among displaced population, and some authors have found a similar average of around 5 (See Table 15). Ruíz-Ruíz (2007) indicated that this average was higher than the national average in 2005, and this sub-study found a similar tendency for 2013. A possible explanation is that displaced people have the same birth rates found in rural areas which are higher than the birth rate found in cities. When comparing average of displaced household's members with Ruíz-Ruíz (2007) data, the proportion of displaced households with one and two members is the same as in this research; however, the proportion of displaced households with 3 and more members was bigger in this research. Furthermore, this research found a better coverage of utilities for households in the participant population in comparison to other studies (see Table 15);

although sewer coverage was less than 100% for displaced households. This study found a 6% less sewer coverage among displaced populations than in non-displaced Barceló Martínez (2007) found 25% less, and Aysa (2006) found 61% less; those findings might indicate that displaced populations are more likely to live in informal settlement without 100% of utilities coverage in comparison to non-displaced populations.

Table 15 Average number of people per household among displaced population in 4 different studies

Author	Years of survey	Average People/ household	National Average- DANE	Household Sample	Place
Ruíz-Ruíz (2007)	2000-2004	5.4	4.1	4200	25 municipalities
Hernández-Bello and Gutiérrez-Bonilla (2008)	2005	5.2	3.9	400	Bogota
Ibañez and Moya (2010)	2010	5.2	3.6	2322	48 municipalities
Pacheco-Coral (2015)	2013	4.3	3.5	97	Armenia

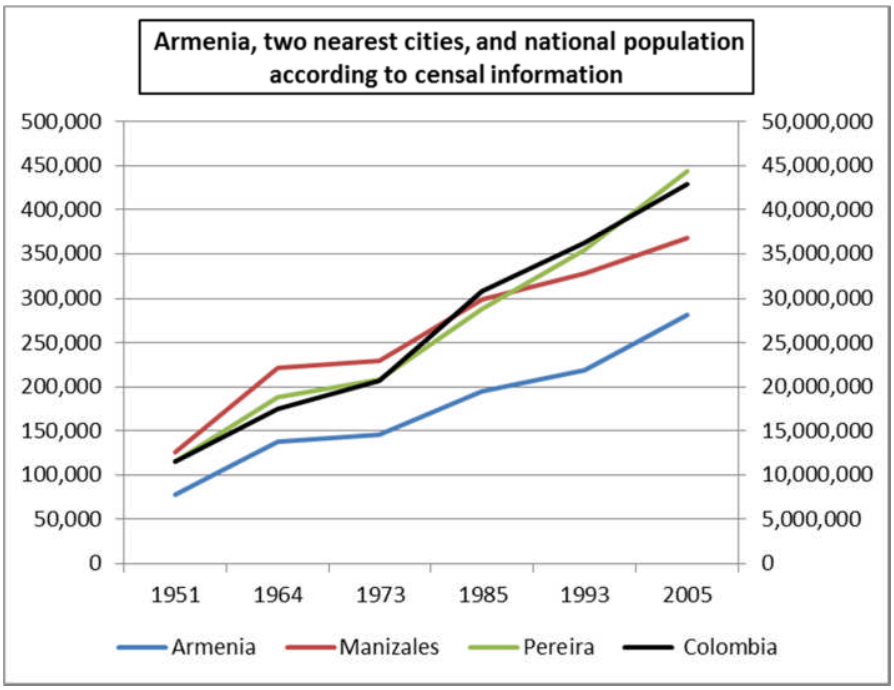
Author's own elaborated with data collected from (Departamento Administrativo Nacional de Estadística, 2014, Ibáñez and Moya, 2010, Hernández-Bello and Gutiérrez-Bonilla, 2008, Ruíz-Ruíz, 2007)

Internal Displacement and its consequences

It is considered that two main causes of Colombian internal migration are the violent events (Bello, 2004) and the developments of cities (Palacios, 2006) as was widely explained in chapter two, section three. The pattern of movement towards Quindío (state where Armenia is located) might be explained both by job-seeking reasons and by first waves of Internal Displacement. Moreover, it seems that many of the participants in this study move out from Armenia and Quindío until the year before this survey was applied. These findings might suggest that many displaced people migrate during the peaks of Internal Displacement. For a better understanding of the migration waves in Quindío and Armenia, three different time periods will be reviewed. Firstly, Before 1990 Armenia was

one of the fifteen most important cities in Colombia's development due to the influx of people looking for a job (See Figure 33); this process might be partially explained due to the fact that by 1950 'la Violencia' (chapter two, section three) pushed people to leave the countryside towards cities such as Armenia and many of those people did not return to their rural homes (Palacios, 2012, Bello, 2004).

Figure 33 Population distribution in Armenia in comparison to other cities and general population



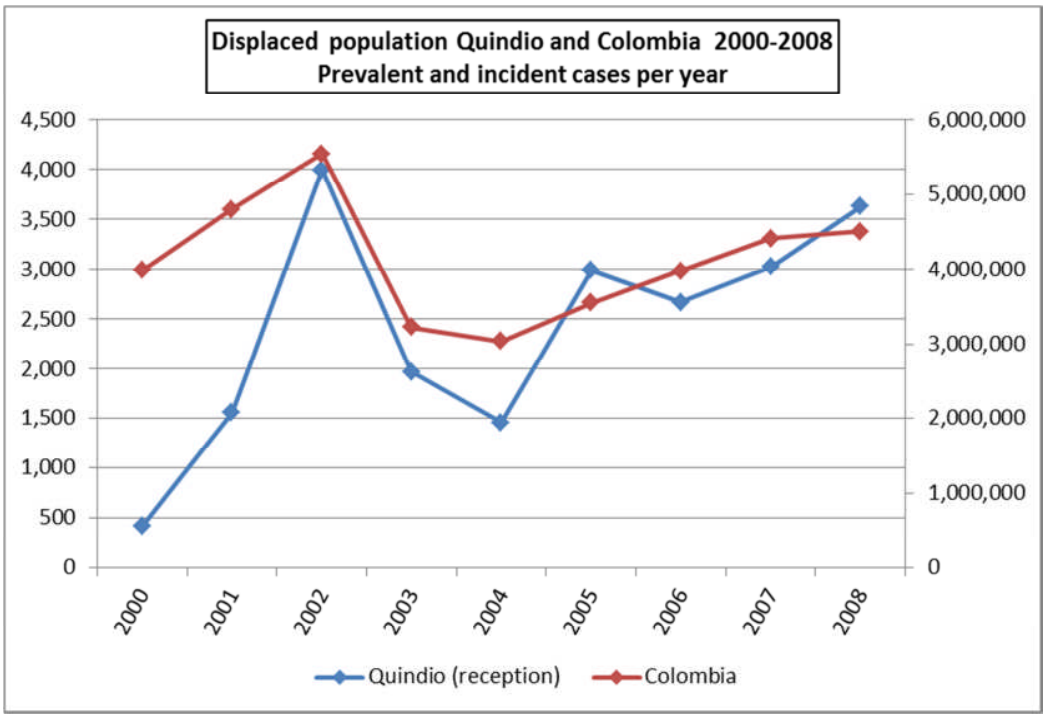
Author's own elaborated with data collected from Giraldo *et al* (2009)

Secondly, in 1999, Quindío's migration pattern might be influenced by the consequences of an earthquake of grade 6.4 on the Richter scale especially affecting the city of Armenia. This research found that more than a half of displaced participants were living in Quindío by 1999, which indicates that before the earthquake there were already waves of IDPs into the city (chapter two, section three). Thirdly, 2000 and 2012[44] 40% of referring had been living in Quindío's cities, but by 2013 60% of displaced participants referring had been settled for one year in their house in Armenia. So, it might be possible that displaced people could migrate to Armenia after the big waves of displacement; Ruíz-Ruíz (2007) found that

[44] 2012 is the previous year of applying this survey.

Quindío received 9,402 IDPs during this period of time; it should be noted that the influx of displaced people towards Quindío shows the same tendency as the national Internal Displacement except for a small peak2005 (See Figure 34).

Figure 34 Internal Displacement in Armenia and Colombia, over a 8-years period



Author's own elaborated with (Unidad para la Atención y Reparación Integral de las Víctimas, 2013, Consultoría para los Derechos Humanos y el Desplazamiento, 2011a, Ruíz-Ruíz, 2007)

In summary, there are two main facts that could explain why Quindío was an important receptor of displaced people. On the one hand, Quindío has a central location reachable from many of the key regions where displaced people have been pushed out since 2005 (Unidad para la Atención y Reparación Integral de las Víctimas, 2013, Consultoría para los Derechos Humanos y el Desplazamiento, 2011a, Ruíz-Ruíz, 2007); on the other hand, Quindío offered a very good subsidized social housing after the earthquake in 1999 (Camargo and Jaramillo, 2011, Valencia-Barrera, 2000). Therefore, both conditions could lead displaced people to choose Quindío and Armenia as a suitable destination for settling.

Although the Colombian government had acknowledged Internal Displacement in 1997 (Bello, 2004) and officially accepted the IDP's accounts in 2013 (Centro Nacional de Memoria Histórica, 2013) aiming to guarantee IDPs' rights. Moreover, it seems that in Armenia IDPs recognized themselves, they have assimilated the new conditions of the place of settling, and they have organized themselves in several associations. It is possible that IDPs' resilience and social networking ability have influenced the inclusion of social protection within the legal framework for IDPs' in Colombia. In addition, the SGSSS has faced implementation difficulties which are reflected in lack of people's affiliations, lack of people's access to services, and lack of quality of services provided to people (Abadía and Oviedo, 2009). Nevertheless, the majority of people affected by these failures are those who should be covered by the subsidized regime such as IDPs. As a result, people have used legal mechanisms seeking to have access and enjoy good quality of healthcare services; according to Abadia and Oviedo (2009) between the years 1999-2005 people interposed 328,191 legal actions aiming to get the state to grant their right of health. This situation also might constitute an external pressure for the central government to assure social protection especially for IDPs.

Additionally, health secretariats across Colombia have faced difficulties in allocating economic and human resources for working with IDPs at the local level, and this situation might lead local governmental leaders to ask for economic aids from the central government aiming to cover IDPs healthcare needs. In this respect, it should be said that the provision of healthcare services for this type of population continues to be a challenge in host areas where forced migrants are settled. In the case of IDPs, their health needs represent a challenge for health authorities and governments especially when ethical, humanitarian and economic issues should be addressed. According to Leaning *et al* (2011) when host governments should make decisions about healthcare service provision for IDPs, they should first evaluate some aspects such as the relevance of IDPs' health conditions among the other issues affecting their wellbeing. The same authors indicated that the allocation of resources according to the different social conditions of IDPs living in host places; and the length of time that it is expected to help IDPs while these populations could change their migration status. Unsurprisingly, same aspects coincide with the

concerns of Armenia's local government in regards to healthcare services provision for IDPs. Moreover, this research found that the local government had allocated two indigenous nurses for working with indigenous IDPs; the allocation of this specific human resource probably had followed a legal sentence against the state. Thus, the local government must guarantee the provision of social welfare for IDPs because of two legal reasons; vulnerable populations (such as indigenous) are protected under the Colombian Constitution and IDPs under the differential approach framework which is also framed in the Constitution. For more detailed information please refer to chapter two, section Colombia.

Moreover, this study found that IDPs are mainly covered by the subsidized regime and this is an indicator of not having either a formal job or enough economic resources. Hernández-Bello and Gutiérrez-Bonilla (2008) found the same results, but Barceló Martínez (2007) found that the coverage by the subsidized regime was similar between IDPs and non-displaced populations. In addition, Armenia's official report (Departamento Nacional de Planeación, 2013) indicated that by 2013, all people who had that right were covered by the subsidized regime. IDPs have the right to access the subsidized regime they can keep it while they have the migrant status and do not have a job. In addition, IDPs would need to have a job with a salary in order to access the contributory regime. Therefore, it is possible to assume that IDPs might have a lack of opportunities to find a formal job in comparison to non-displaced people.

With regards to the barriers for accessing and enjoying healthcare services, the findings from this research are consistent with other studies describing how the Colombian population has faced similar type of barriers since the implementation of the SGSSS (Abadia and Oviedo, 2009). However, in this research the participants' migration status is relevant and might be a barrier for IDPs to access the SGSSS. Furthermore, the migration status might represent an opportunity for IDPs-related associations and NGOs to claim social protection rights to the state. I explain how this migration status has represented a barrier for accessing healthcare services, but also an opportunity for IDPs gaining political

spaces and recognition in Armenia. On the one hand, IDPs recognized themselves as different from the host populations because of their migration status, and some of them considered that this status might constitute a barrier to access healthcare services. Gideon (2013) stated that in general the migrant status played a relevant role in accessing and enjoying healthcare services in host places. The author also mentioned that even when migrants were entitled to access healthcare services, they would need to have basic knowledge about the provision of those services, to have access to resources, and to receive support and advice. Additionally, Khan (2014) found in a mixed research, done with 428 Pakistani IDPs, that less than 5% of participants could reach the host healthcare facilities while 76% were attending a mobile clinic[45]. Furthermore, participants referred to having economic barriers and to face institutional deficiencies (such as lack of human resources and poor quality of services) which are similar findings to the results presented in this chapter.

On the other hand, results show that IDPs had organized themselves in different associations whereas non-displaced people had associated with the government in partnerships. According to several authors, people who are forced to migrate suffer alienation and stigmatization by the government and by the host populations (Crowley and Hickman, 2008, Gilroy, 1990); in the case of Colombian displaced people this stigmatization may have represented an opportunity for them to organize themselves in associations. This statement could be reflected in the IDPs' ability to consolidate networks and to empower themselves which eventually led them to have two nurses paid by the local government working exclusively with them. In this respect, Gideon (2013) pointed that Latin-Americans' networks helped migrants living abroad for them to relate with healthcare services, to obtain healthcare advice and treatment either in the host or origin country, and to feel confidence to make decisions in regards to health issues. Moreover as Gurman and Becker (2008) found that Latin-American migrants preserve their cultural values when they are abroad and those values help them to relate with peers and the healthcare

[45] This clinic consisted of an ambulance with a small dispenser service weekly or fortnightly.

facilities. Both social networking and cultural values might have led IDPs to use legal mechanisms outside the SGSSS allowing them to enjoy healthcare services.

Regarding empowered populations, Hatzidimitriadou and Çakir (2013) summarized three levels of empowerment: the individual, group and community level. The first level is related to a person's ability of making decisions and being aware of social and political contexts. The second one is related to people's ability to exercise participative roles within a group; as well as, giving and receiving support and approval. The third one is more related to the visibility and legitimacy of the group in the social context. Both the second and third levels could lead people to gain spaces and recognition in the political context. As an example, the authors described how self-groups of Turkish women in the United Kingdom did not represent only spaces for women to find support and help in regards to wellbeing issues, but also opportunities for women's activism to claim social protection rights for them. In this PhD research, IDPs' empowerment seems to be a result of IDPs' social networking; likewise, social networking seems to be the IDPs' response of being forced migrants in the host city of Armenia.

Final words

This chapter presented the methods for undertaking fieldwork in a dengue endemic Colombian city, which is also affected by Internal Displacement. Main findings related to socio-demographic information of IDPs and non-displaced people participating in the study were described. In addition, the barriers to access the healthcare system that participants have found were explained and analysed. In the next chapter, participants' opinions, perceptions' and practices towards dengue disease are explored. In addition, findings related to the risk that participants have to be exposed to dengue vector are described.

Chapter 7: Results from fieldwork in Colombia part 2

Statement of authorship

I carried out the work presented in this chapter. The collaboration with the Centro de Estudios e Investigación (CEIS) - Fundación Santa Fe de Bogota provided the infrastructures in the field to develop my project in safe conditions. Information of surveyed non-displaced households was obtained from CEIS datasets. CEIS also shared with this project the instrument for applying the surveys in IDPs households.

This chapter aims to describe the effect of Internal Displacement as a risk factor for dengue occurrence using information collected through qualitative and quantitative approaches. Findings include the participants' perceptions and practices towards water use and storage, and their knowledge and attitudes about dengue prevention and control, as well as, dengue vector counts measured in households.

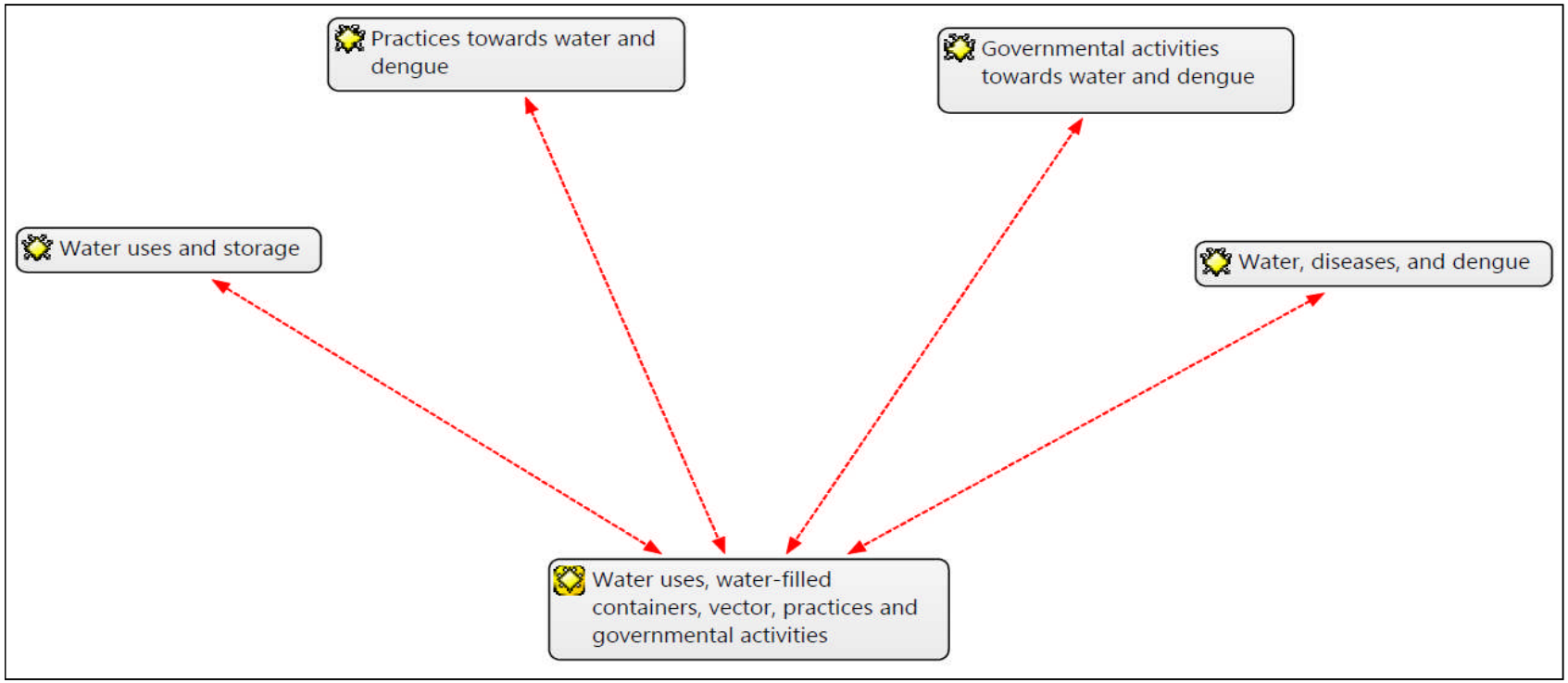
Chapter 7, Section 1: Water usage, water-filled containers, and dengue vector abundance

According to the methodology explained in the chapter six, the detailed results in this chapter correspond mainly to the outcomes from the focus groups, the entomological survey, and the Knowledge, Attitudes and Practices (KAP) survey. First, general information extracted from interviews and from direct participant observation is given, and second, analysis of distribution of containers and vector counts in containers is displayed. Third, information about vector counts within households is presented, and finally, the discussion about main findings is given at the end of the section.

Description of findings

Results from analysing the category water uses and storage are displayed along with other results from quantitative analysis. Furthermore, the information related to water-filled containers and vector abundance is presented. Other qualitative categories presented in figure 35 are explained in section two of this chapter.

Figure 35 Categories related to water and explored in discussion groups, focus groups, and interviews



Water uses and storage

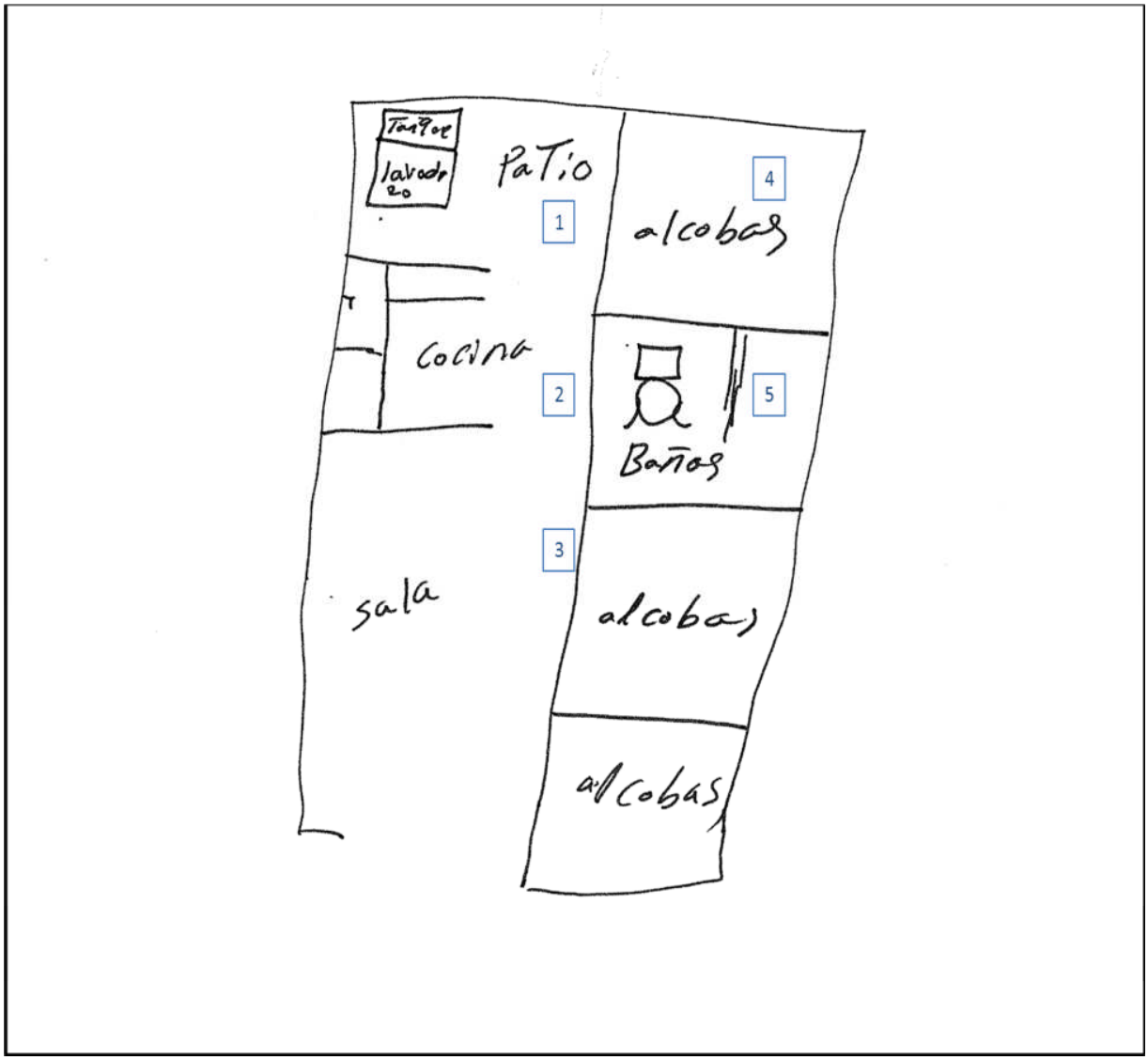
Results from direct observation indicated that people perceived water as a relevant natural resource which makes Colombia unique for its biodiversity, and during focus groups, participants addressed the relevance of water for their way of living. However for non-displaced people water's value was given by its use, whereas for Internal Displaced People (IDPs) water was valuable because water meant life. In these two quotes, participants in different focus groups were asked why water was important for them:

> *For surviving, because what [would happen] if you do not have water?* [sic] (Participant 1, non-displaced people focus group 1, Armenia, 2014)

> *The water is the life of us, if [the world] would not have water who [could] live?* [sic] (Participant 2, IDPs focus group 1, Armenia 2013)

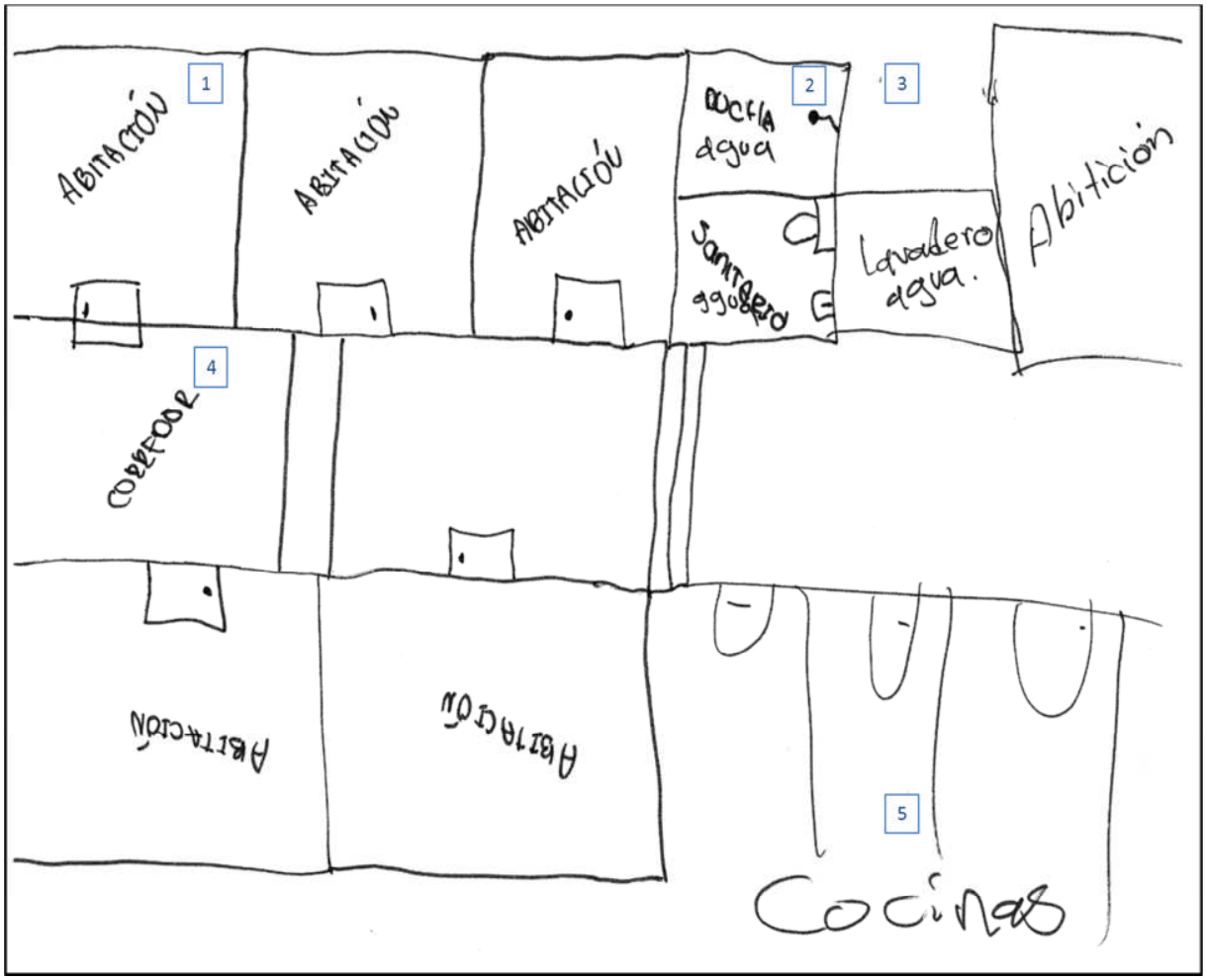
A participative diagnosis technique was applied in some of the IDPs focus groups. So, people were asked to draw their relationship with water before and after the Internal Displacement. Results showed differences in the description of this relationship depending on the duration of the Internal Displacement; for instance, IDPs suffering long term displacement drew their relationship with water's tap location within their houses (See Figures 36 and 37):

Figure 36 Description of a household's rooms distribution specifying water tap location (a)



Sketch of the household interior design done by one participant in an IDPs discussion group. Numbers indicate type room and other details as follow: 1 Backyard with detail of cement tank. 2 Kitchen. 3 Living room. 4 Bedroom. 5 Bathroom with detail of toilet. (Participant 1, IDPs discussion group 2, Armenia, 2013)

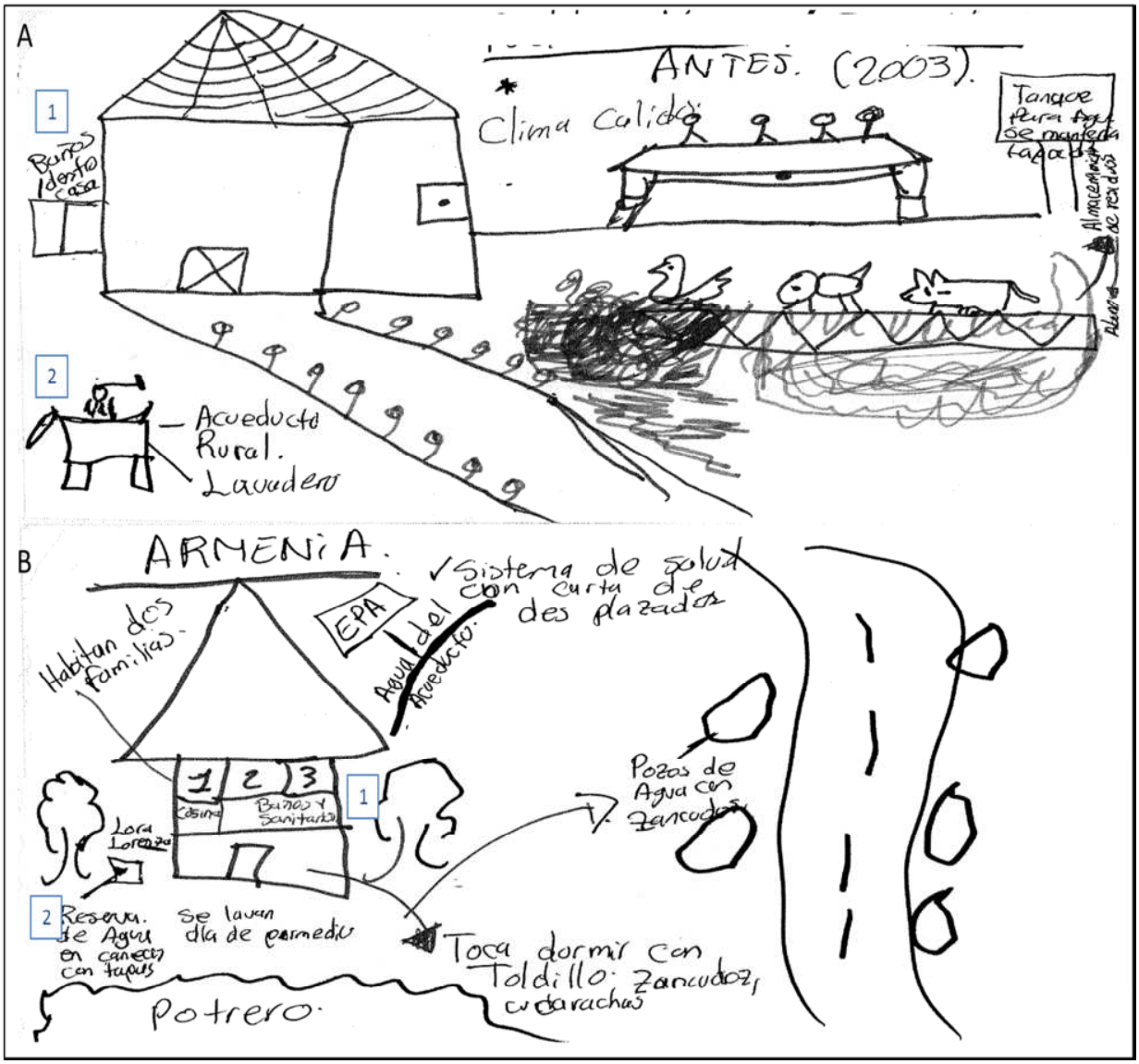
Figure 37 Description of a household's rooms distribution specifying water tap location (b)



Sketch of the household interior design done by another participant in an IDPs discussion group. Numbers indicate type room and other details as follow: 1 Room. 2 Bathroom with detail of toilet and shower. 3 Detail of cement tank for water storage. 4 Hall between bedrooms. 5 Kitchen. Participant 2, IDPs discussion group 2, Armenia, 2013)

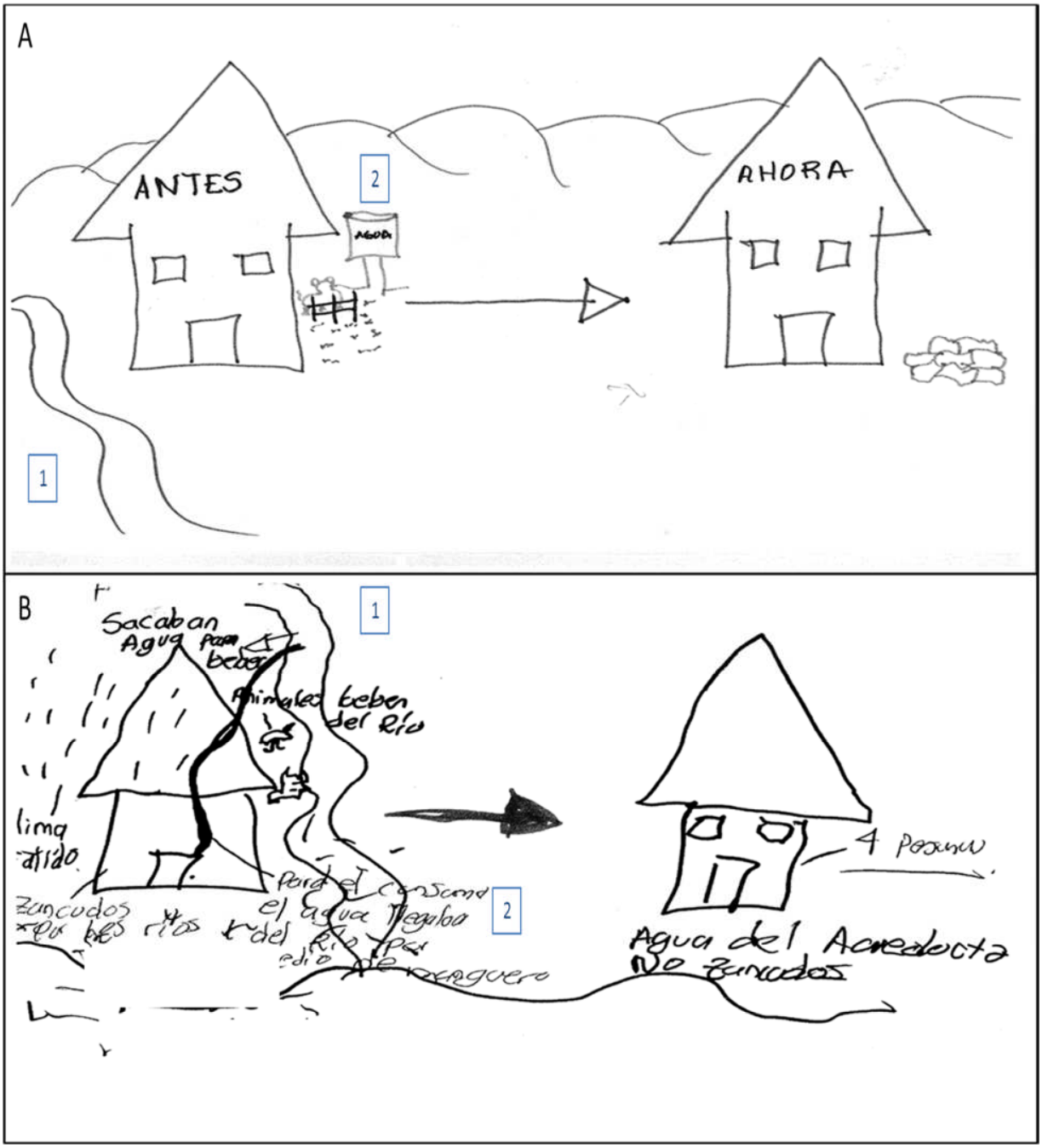
On the other hand, IDPs suffering recent displacement tended to draw the differences between the places where they lived before and after the Internal Displacement, emphasizing about the surrounding environment details (See Figures 38 and 39). Furthermore, these IDPs represented very vividly their previous lifestyle in rural areas when comparing with their new life in urban areas.

Figure 38 Participant' drawings about his relationship with water sources before and after the forcible displacement



Sketch of the previous place of living in a Colombian rural area household (A) in comparison to the new place of living (B) done by a participant in IDPs focus group. 1 Bathroom and toilet location. 2 Detail of water-filled containers and also the type of pipe network providing water service (A-rural & B-urban). (Participant 3, IDPs focus group 2, Armenia, 2013)

Figure 39 Drawings about participants' relationship with water sources before and after the forcible displacement



Sketches done by two participants during an IDPs' focus group, showing IDPs previous place of living in Colombian rural areas (left) in comparison to their new place of living in Armenia (right). 1 Detail of nearer river. 2-A Detail of water tank, and B explanation of getting water through a garden hose from the near river. (A: Participant 3, IDPs Focus group 2, Armenia 2013, B: Participant 4, IDPs focus group 2, Armenia, 2013)

It should be highlighted that in almost all the drawings collected, IDPs drew with detail the water tank and the toilet location, as well as the potential water sources. This finding is important because during many generations the culture of having cement tanks in households' backyard has been preserved in Colombia. This custom has facilitated households' water storage in regions without any or poor pipe water service provision, and acts as a constant source of water for cleaning activities within households.

With regards to quality of the water for human use, non-displaced people did not address this topic but IDPs did. However, there were differences between IDPs suffering recent or long-term displacement. Recently displaced people considered that water from natural sources rather than tap water was drinkable.

> P1*: Well in the town*[46] *the water is potable*
>
> *Interviewer: Is it drinkable? It could be used for... (Interruption)*
>
> P1: *Yes, because it [the water] springs there in the town* [sic] (Participant 1, IDPs focus group 3, Armenia 2013).

In addition, IDPs suffering long-term displacement mentioned their distrust in the quality of water which came by the pipe network:

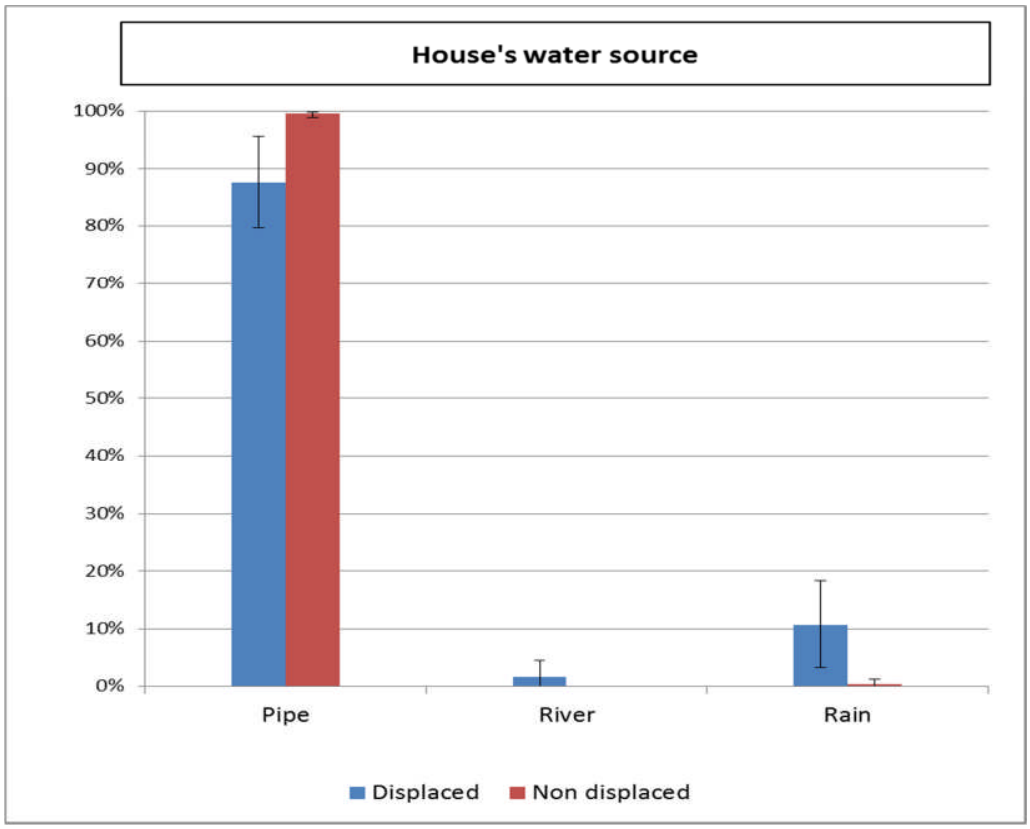
> *Interviewer: Do you have access to potable water in your neighbourhood?*
>
> *[I] do not think so. There [in my neighbourhood] the water is supplied by the pipe network and I do not know how [in which conditions] the water comes* [sic] (Participant 2, IDPs focus group 1, Armenia, 2013)

Moreover, the KAP survey revealed that in 100% of non-displaced population households, water was mainly supplied by pipe network in comparison to 87.7% of IDPs households. The other 12.3% of IDPs households obtained water from rain collections or river (See

[46] One of the urban small areas added to Armenia

Figure 40). It should be highlighted that the IDPs collecting water from the river did not have taps in their households at the moment of applying this KAP survey.

Figure 40 Households' main source providing water



Regarding water usage, participants gave water similar uses mainly for housework (e.g., washing clothes, washing up, cooking, and flushing the toilet), and also the majority of people referred they used pipe water and some IDPs mentioned they were using rain water for human consumption:

> *My son has asked me whether I considered that the rain water we collected from the roof was cleaner than the one we collected directly in the pot and which I can use... I said to him [that] the one [collected] directly from the cloud to the pot is better, and he said to me 'even that one is necessary to boil it and you always drink it [without doing that].' I replied to him that I also drink the water from the tap without boiling it... He*

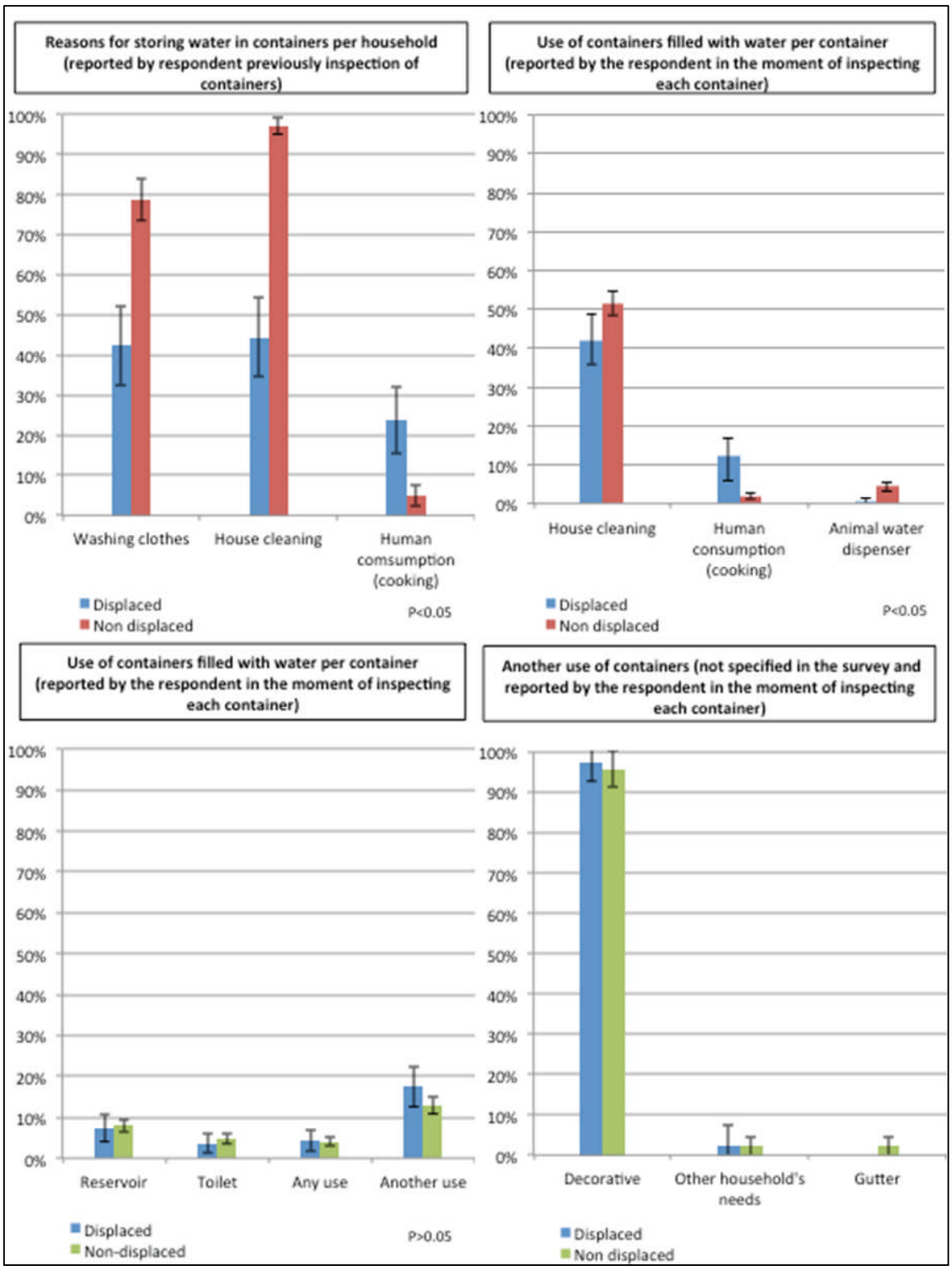
> *said to me that I [needed] to boil it [tap water] too before drinking it* [sic] (Interviewee 3, IDPs, Armenia, 2013)

In addition, 65.98% of IDPs and 75.08% of non-displaced household stored water, and these results were not significantly different. Also, in focus groups participants affirmed that they stored water and their main reason was the distrust in the continuity of pipe water service:

> *Interviewer: Why do people storage water? Why do you have water in the tank? What is the use of that type of water?*
>
> P2*: For washing clothes and because [I] am precautious, I have [that water when] the water is gone [service is suspended] and they [company providing pipe water service] do not warn us* [sic] (Participant 2, non-displaced focus group 1, Armenia, 2014)
>
> *P3: [I store water] at least for washing up* [sic] (Participant 3, non-displaced focus group 1, Armenia, 2014).
>
> *P1: For washing up, for [flushing] the toilet, so [I] always have the tank filled [with water] just in case* [sic] (Participant 1, non-displaced focus group 1, Armenia, 2014).

The KAP survey found that the reasons to store water among IDPs and non-displaced households varied from washing clothes (IDPs 42.27% vs. non-displaced 78.69%), house cleaning (IDPs 44.33% vs. non-displaced 97.13%), and human consumption (IDPs 23.71% vs. non-displaced 4.92%) (See Figure 41). At the moment of containers' inspection, people referred as uses of stored water: house cleaning (≅40% of IDPs vs ≅ 50% of non-displaced), human consumption (≅12% IDPs vs ≅ 2% of non-displaced), and animal consumption (≅2% of non-displaced) (See Figure 41). Similar uses of stored water among participants were as reservoirs, toilet, spare use, and other types of use ($p>0.05$). A separated analysis showed that almost all of category labelled as 'another type of use' was in fact use of water for decorative purposes (e.g., flower vases, plants in water, and potted plants) in 97.5% of IDPs and 95.68% of non-displaced containers (See Figure 41).

Figure 41 Reasons for storing water and uses that people give to the stored water



It should be said that this finding of participants using containers with decorative purposes is relevant given that this behaviour is another custom adopted by Colombians and is independent of the geographical region or people's social class. This custom might be related to the biodiversity of the country, as well as the availability of plants and flowers which could be used indoors. Nonetheless, direct observation allowed me to corroborate that some of the neighbourhoods, where IDPs and non-displaced people lived, either lacked green areas or in the case they existed, they were not enough safe for people to make use of them. This situation might also prompt people to have flower and plants indoors.

Local authorities have different opinions, in regards to the people's custom of storing water. First, it was mentioned that after the earthquake in 1999 the coverage and networks of pipe water and sewerage were improved:

> *Now [people] are warned, now the [pipe water service] provided by the municipal public companies[47] is more efficient. There are more maintenance works, so is more difficult that the service collapses and [then] the service will be suspended for many hours. However, if it is necessary to do some maintenance or repair work, [the municipal public company] warn people [about that situation], and people collect water but they should not store it for long-time periods* [sic] (Interviewee 4, public health worker, Armenia, 2013).

Second, it was considered by educative workers that people store water as a custom of having reserves of water in case the service is suspended or interrupted:

> *In every house [people] have the tank or lavadero, and usually they keep it filled with water. The problem is when the tank is not kept in adequate conditions, because that [situation] led to have dengue... [People] continue to have the tank filled with water just in case [they could use the water] if necessary* [sic] (Interviewee 1, working with IDPs, Armenia, 2013).

Nevertheless, participants explained their reasons for storing water in spite of the improvement of pipe water service. Non-displaced people mentioned two reasons, firstly the fear of having interruptions in the pipe water service, and secondly the possibility of saving some money for not using running water:

[47] Municipal public companies in Colombia are the utilities providers which belong to the State. In this section, the interviewees referred to pipe water or sewer's management companies.

> P1*: [I] store water just in case... For instance today I was careless [I did not store water] and there is not water [service] in my neighbourhood, so I could not prepare the lunch* [sic] (Participant 1, non-displaced focus group 1, Armenia, 2014)
>
> P2: *The tank should be almost empty in order [us] to wash it at least every two days and do not need to throw the water away. So, I fill it [the tank] until certain level and I [calculate] how much [water] I am going to use moping and doing other [activities]. Therefore, I fill it [the tank] with a minimum [amount] of water* [sic] (Participant 2, non-displaced focus group 1, Armenia, 2014)
>
> *Interviewer: but, [do you] empty it [the tank]?*
>
> P2: *Yes* (Participant 2, non-displaced focus group 1, Armenia, 2014)
>
> P1*: She (P2) [kept the tank almost empty] because she does not like them [company providing pipe water service] charges her more for the water [she uses]* [sic] (Participant 1, non-displaced focus group 1, Armenia, 2014)

IDPs only mentioned having water reservoirs in the households, in case they suffer interruptions of pipe water service:

> P3: *Of course, we need to store water because sometimes no one warns us that [the service] will be suspended. So, we need to store water, but [we] should change it daily, because that [stagnant water] attracts a lot of mosquitoes, [for example water] in tyres or any water collected and stored for several days* [sic] (Participant 3, IDPs discussion group 1, Armenia 2013).

Until this point, motivations and reason for certain water uses and people's behaviours toward water storage have been exemplified. Then, it is necessary to look how the water-filled containers within households are bringing or not conditions for dengue vector to use them as breeding sites.

Water-filled containers and vector abundance

In this research, participants were asked whether they had cement tanks with capacity superior to 20 litres (coded as cement tanks type A) and capacity inferior to 20 litres

(cement tanks type B), these types of tanks are known in the communities as *albercas* or *lavaderos.* Furthermore, people were asked if within their households they had other type of containers where water could be stored. For example, cement tanks with capacity superior to 200 litres, elevated tanks, and a series of small containers, buckets, small barrels, flower vases, gutters, and natural collectors of water (such as trees, plants and vegetation). Moreover, participants were asked whether those containers were filled with water, because water-filled containers are potential sites for *Aedes aegypti* to lay eggs and complete its life cycle. So, it is important to know the amount of containers, as well the proportion of water-filled containers and other characteristics allow the mosquito to breed and affect its rate of surviving inside households (chapter two, section one).

Furthermore, whether containers' characteristics allow the mosquito to complete its life cycle, the containers are known as breeding sites. Additionally, if a container allows the mosquito to survive up to pupa stage, this container is a key breeding site for the vector. Also, a container is positive if it has at least one larva or pupa or both type of immature forms. When pupal productivity is measured then the container is known as a productive breeding site. In this chapter, results are showed in terms of productivity of pupae in containers (World Health Organization, 2011a). Finally, in order to have a better understanding of statistical methods and measurements used in this chapter please refer to chapter six.

Containers characteristics

Data from the KAP survey revealed that among the 422 participant households a total of 1418 containers were counted, and 16.1% of them were found in IDPs households and 84.9% in non-displaced ones. The overall proportion of containers filled with water was 71.5%, within IDPs households was 82.5%, and within non-displaced ones was 69.4%.

Table 16 Inspected containers in visited households given in absolute numbers

	IDPs	Non-IDPs	Total
Visited houses	97	325	422
Inspected containers	228	1190	1418*
Containers with water	188	826	1014*

*p<0.05

From the 1014 containers filled with water, 926 (91.1%) of them were inspected and the majority of those were filled with pipe water. However, within IDPs households around 20% of the containers were filled with pipe and rain water compared to less than 4% in the non-displaced households. In IDPs households, any roofs cover 22% of containers, whereas in non-displaced households more than 90% of containers were totally covered by the roof. In addition, nearly 20% of containers in IDPs households had a lid covering the container, whereas among non-displaced households 11.3% of containers were covered totally by a lid and a small percentage of containers were partially covered (See Table 17). In addition, through observation during the visits it was verified that some of containers with lid in IDPs households corresponded to high tanks provided by the government.

Table 17 Main characteristics of water-filled containers

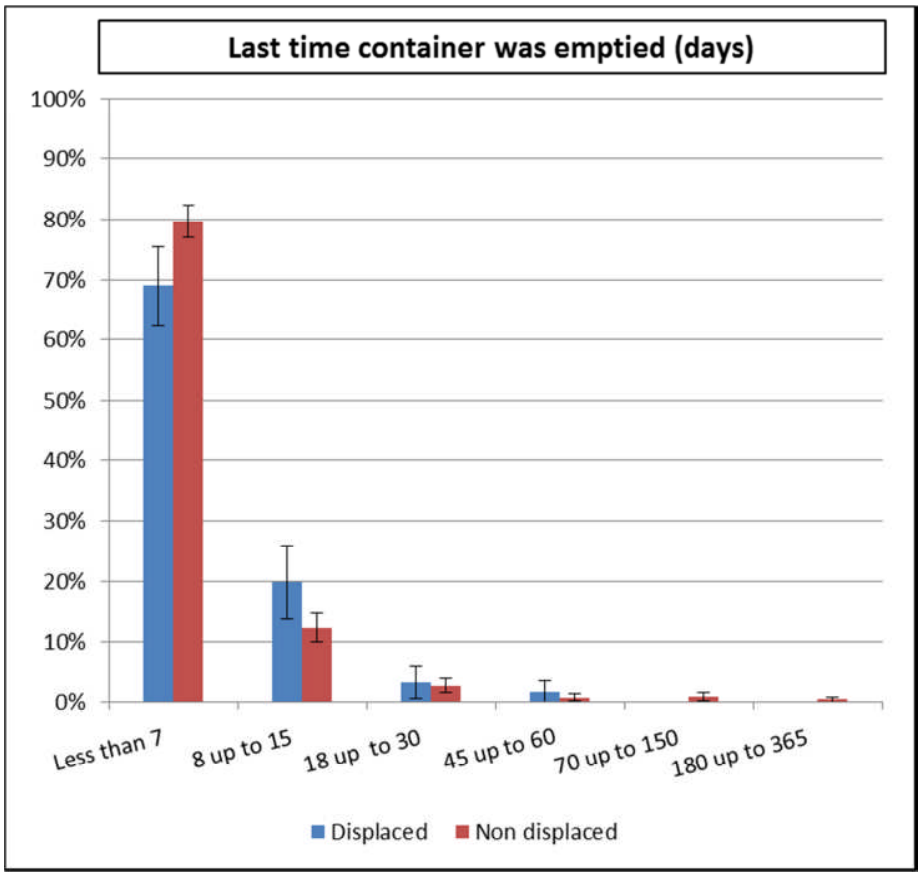
Containers characteristics	IDPs	Non-IDPs
Accessible for inspection	74.2% (67.9% 80.5%)	95.4% (94% 96.8%)
Type of water: pipe	76.7% (70.5% 82.9%)	91.2% (89.2% 93.1%)
Type of water: rain	3.9% (1.1% 6.8%)	5.3% (3.8% 6.8%)
Type of water: both	19.3% (13.5% 25.2%)	3.5% (2.2% 4.8%)
Under roof: totally	72.7% (66.2% 79.3%)	93.8% (92.0% 95.5%)
Under roof: partially	5.1%	6.2%

	(1.8% 8.4%)	(4.5% 7.9%)
Not under roof	22.2% (16% 28.3%)	0
Covered totally with lid	22.2% (16.% 28.3%)	11.4% (9.2% 13.5%)
Covered partially with lid	0	0.6% (0.1% 1.1%)
Not covered with lid	77.8% (71.7% 83.9%)	88% (85.8% 90.2%)

p<0.05

Containers within IDPs households were less likely to be emptied (at least weekly) than in non-displaced households (69% in IDPs and 80% in non-IDPs) (See Figure 42):

Figure 42 Last time that people empty each empty container



Containers as potential breeding sites

Regarding containers distribution among households, IDPs households have fewer containers in comparison to non-displaced (2.4 containers per household vs. 3.7 ,p=0.02). It should be noted that this distribution varies by container type, on the one hand IDPs households are more likely to have elevated water tanks (26.3% vs 5%, p<0.000), but they are less likely to have buckets (7% vs. 17.3%, p<0.0000) or other type of small containers (1.32% vs. 8.74%, p<0.0000). On the other hand, non-displaced people are more likely to have cement tank type A (19.75% vs. 3.51%, p<0.0000). However, both types of populations have a similar number of cement tank type B (38.6% vs. 26.3%, p=0.05) and flower vases (18.42% vs. 13%, p>0.05) (See Table 18).

Table 18 Distribution of containers by type classification

	IDPs		Non-IDPs	
	Frequency	Average number of containers per household	Frequency	Average number of containers per household
Low tank	7 3.1%	0.07	41 3.4%	0.13
Elevated tank	60 26.3%	0.62	60 5%	0.18
Cement tank type A	8 3.5%	0.08	235 19.8%	0.72
Cement tank type B	88 38.6%	0.91	313 26.3%	0.96
Small containers	3 1.32%	0.03	104 8.7%	0.32
Bucket, small barrel	16 7%	0.16	206 17.3%	0.63
Flower vase	42 18.4%	0.43	155 13%	0.48
Tire*	0		3 0.01%	0.01
Sewer*	0		2 0.01%	0.01

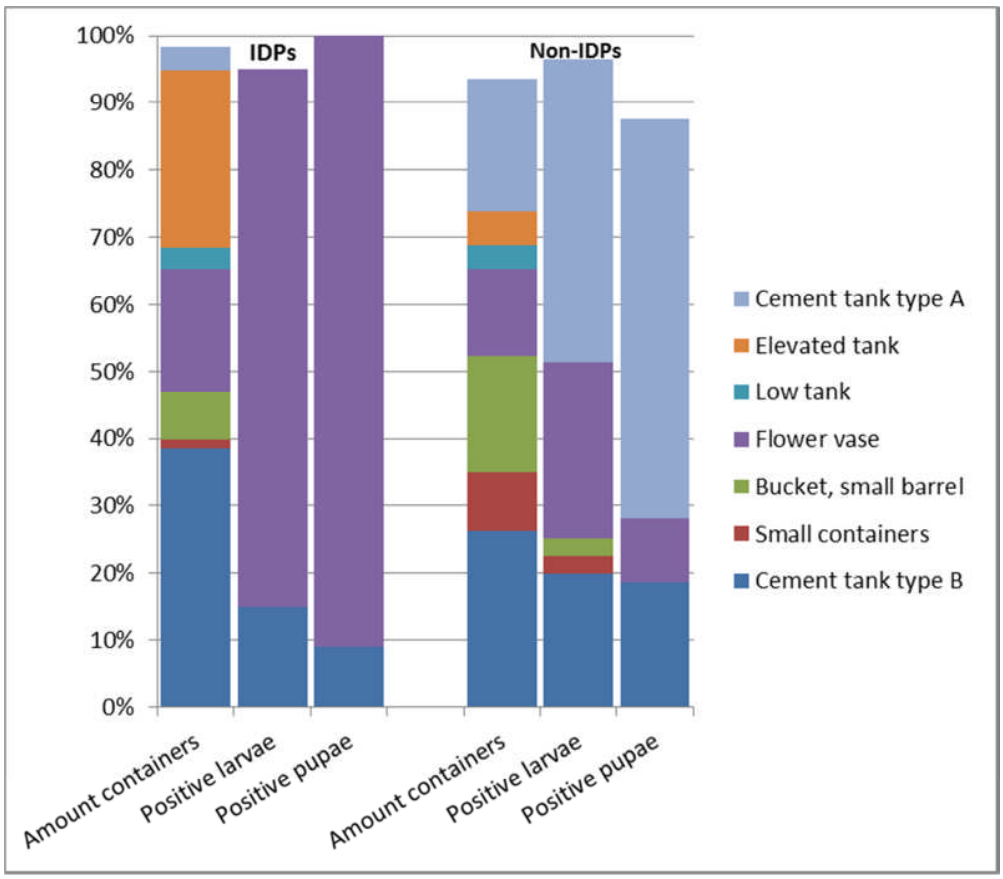
Can, bottle, lid*	0		25 2.1%	0.08
Natural	2 0.9%	0.02	1 0.08%	0.00
Gutter	2 0.9%	0.02	38 3.2%	0.12
Other	0		7 0.6%	0.02
Total	228	2.4	1190	3.7

*Public space items were not assessed in settlements where IDPs where located

Containers as breeding sites positive for larvae

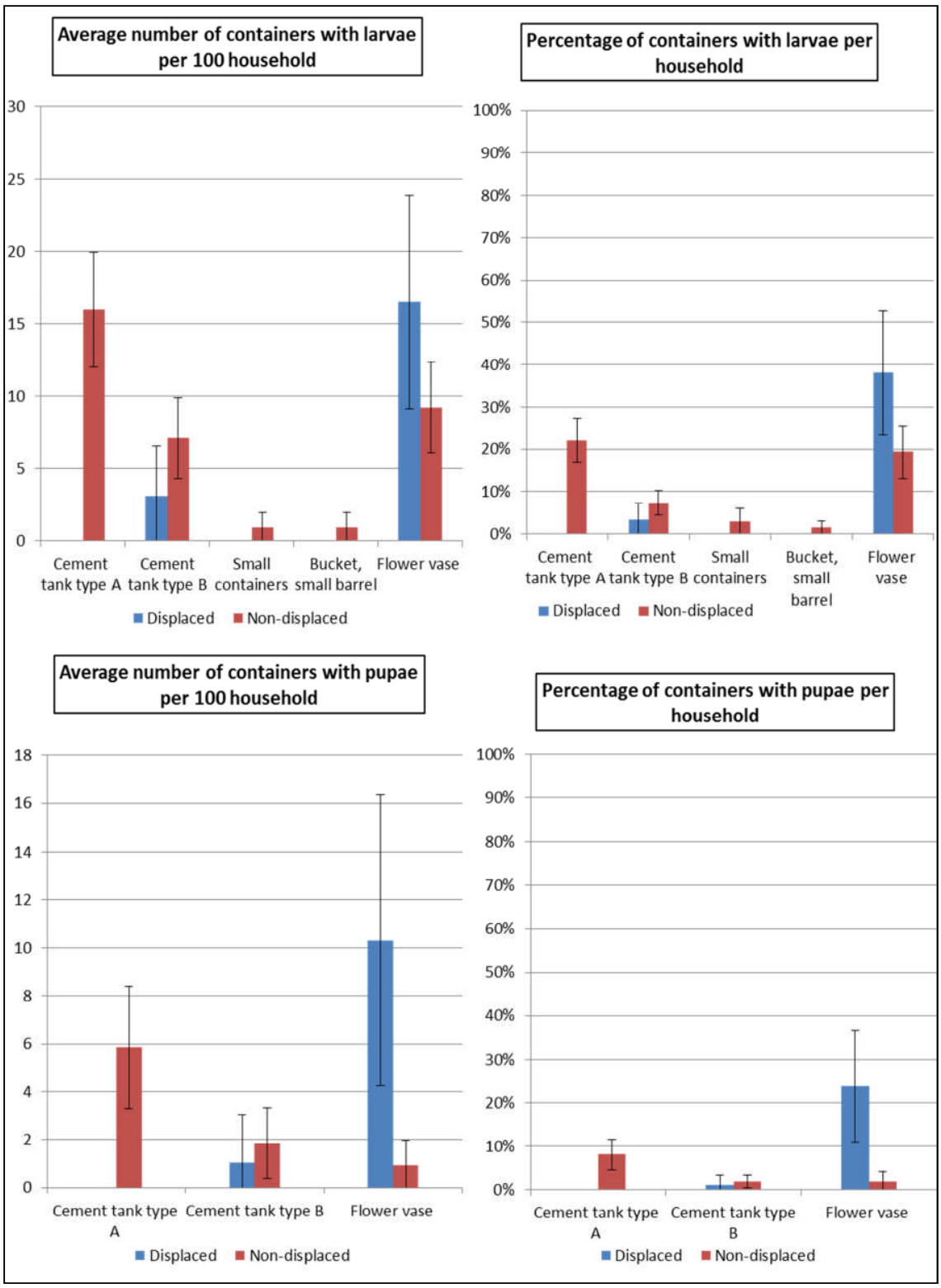
Inspected containers identified as breeding sites and had larvae varied from IDPs and non-displaced households. Most of the containers with larvae in IDPs households were flower vases (80% of larvae) and cement tank type B (accounted for 15% of containers with larvae). In non-displaced households most of the containers with larvae were cement tanks (cement tank type A (45%) cement tank type B (20%), and only 26% of the containers with larvae were flower vases (See Figure 43).

Figure 43 Distribution of containers and infested containers discriminating which immature forms were found



The average number of larvae infested containers per household is higher in non-displaced than IDPs ones (0.3 vs 0.2, $p<0.005$). Furthermore, the majority of exposure to larvae in IDPs households comes from flower vases (80% vs 26%, $p<0.000$), whereas the majority of exposure to larvae in non-displaced people comes from cement tanks (types A & B) (65% vs 15%, $p<0.000$). The proportion of containers that have larvae is similar in IDPs and non-displaced households (8.8% vs 9.7%, $p>0.05$). However, flower vases in IDPs households are more likely to contain larvae than in non-displaced households (38% vs 19% $p=0.01$). Cement tanks (types A & B) in non-displaced households are more likely to contain larvae than in IDPs households (29.5% vs 3.4% $p=0.002$) (See Figure 44).

Figure 44 Distribution of infested containers in households, discriminating each immature form



Containers as breeding sites that were productive for pupae

A similar pattern was seen for containers with pupae. Productive breeding sites in IDPs households were flower vases (91% of all the containers with pupae were flower vases and 9% were cement tank type B). In non-displaced households most of the containers with pupae were cement tanks (cement tank type A 59%, cement tank type B 19%) and only 9% of containers with pupae were flower vases (See Figure 44). The average number of pupae infested containers per household is similar in displaced and non-displaced households (0.11 vs 0.98, $p>0.05$). The majority of exposure to pupae in IDPs households comes from flower vases (91% vs 9%, $p<0.0001$), and the majority of exposure to pupae in non-displaced households comes from cement tanks (types A & B) (65% vs 9%, $p <0.001$). The proportion of containers that have pupae is higher in IDPs than non-displaced households (4.8% vs 2.7% but is not significant, $p>0.05$). However, flower vases in IDPs households are more likely to contain pupae than in non-displaced households (24% vs 2%, $p<0.0001$).

Immature forms (larvae and pupae) distribution

The house and Breteau indexes were significantly lower in IDP households than in non -DP households ($p <0.05$), whereas container index was similar among participant households (See Table 19):

Table 19 Entolomogical indexes

	IDPs	Non-IDPs	Total
Container index Percentage of water-holding containers infested with larvae or pupae	9.21	11.4	9.7*
House index Percentage of houses infested with larvae and/or pupae	16.5	28	25.4*

Breteau index Number of positive containers per 100 houses inspected	21.6	35.7	32.5*

*(Fisher exact test <0.05)

In general, the ratio of larvae to pupae (a low ratio indicates a high proportion have reached maturity and will soon become adult mosquitoes with potential to transmit dengue) is smaller in IDPs containers, but this ratio varies among different type of containers across the households. For example, among non-displaced households cement tanks type A have the smallest ratio whereas flower vases have the biggest one. Furthermore, when comparing the ratio larvae: pupae in flower vases it seems that the amount of pupae is similar to the amount of larvae in IDPs households, whereas in non-displaced households amounts of larvae and pupae are different (See Table 20).

Table 20 Ratio Larvae: Pupae

Type of container	IDPs	Non-IDPs
Cement tank type A	0	2.7 : 1
Cement tank type B	3 : 1	3.8 : 1
Flower vase	1.6 : 1	10 : 1
Gutter	0	1 : 1
Total	1.8 : 1	3.6 : 1

Discussion

Summary

Perceptions about water uses and storage were explored through qualitative and quantitative methods. Results are integrated in the first part of this section. Then, the results from the entomological survey describe water-filled containers characteristics, and

dengue vector abundance within households. Finally, the differences and similarities in vector abundance among non-displaced and IDPs households are highlighted.

Explanation of findings

Water uses and storage

In general participants from both types of populations agreed in the role of water in their lives, so that water was not only a resource but also a relevant part of their daily activities, an idea which was also found by Suarez *et al* (2009). However, only IDPs mentioned that water meant life, and these differences could be attributed to the fact that IDPs came from rural areas where it is possible they had lived close to natural water sources. Moreover, when IDPs were invited to draw their relationship with water before and after the Internal Displacement process, those suffering long-term Internal Displacement pointed out their use of water within households. IDPs suffering recent Internal Displacement not only drew also that use of water, but also included the sources of water in the surroundings of their households where they live before. It should be highlighted, that IDPs are migrants whose main motivation for fleeing is avoiding threat conditions in their place of residence rather than looking for new places to move (Ruíz-Ruíz, 2008). So, these results might be partly related to IDPs processes of adaptation to their condition as IDPs, and also to their mourning process for the loss of their assets and lifestyle in rural areas (Médicos Sin Fronteras, 2010). Furthermore, the fact that in the participants' sketches the water tank was drawn with detail might suggest how important the water tank culture is for people in Colombia. As Hernandez *et al* (2002) mentioned, one objective of the first campaigns for eradicating dengue vector in Colombia back in 1969 was working along with communities to permit the treatment of water-filled containers located in their household's backyards.

In addition, IDPs mentioned that they considered water which comes directly from natural sources to be safer to drink than tap water. In this regard, a Vietnamese study (Tran et al., 2010) points out that people preferred the rain water than the tap water because of their

concerns about the chemical treatment given to the latter. In this research, some IDPs were concerned about the quality of the water that comes from the pipe network. The study done in southern Vietnam (Tran et al., 2010) shows that people living in rural areas where the pipe water network was recently implemented, still continue using rain water in spite of the existence of the tap water. In that study, peasants preferred to use rain water because of its availability and because they were accustomed to use it. In the city of Armenia, the number of houses connected to the piped water network in 2013 was 79,615 which corresponded approximately to 98.6% of the total number of houses registered in the municipality according to the last census (Departamento Nacional de Planeación, 2013, Departamento Administrativo Nacional de Estadística, 2005). In this research it was found that all the non-displaced households had piped water service, but not all IDPs households had it and some of them relied on river and rain water for covering households' needs. Regarding the quality of the piped water in Armenia, academics (Martinez-Pineda and Betancourth-Rincon, 2003) and governmental insitutions (Corporación Autónoma Regional del Quindío, 2015, Instituto Nacional de Salud, 2013, Contraloría Municipal de Armenia, 2013) have agreed that the water of Armenia had a very good quality. Also, the water treatment plant had good equipment and good quality control processes. The different authors have pointed out that the plant had the ability of treating it before the water could reach the households, in case the water coming form the rivers had any problem (especially in rainy seasons when the rivers can have a mixture of rain water and potential contaminants such as soil, sticks, etc.). In addition, Armenia city has had advances in activities to avoid the contamination of rivers and to promote environmental protection aiming to maintain in good conditions the ecosystems providing water (Contraloría Municipal de Armenia, 2013). Nonehteless, whether IDPs are located in settlements where there is not a good piped water network coverage (for instance illegal settlements) they might need to access water with less quality than non-dispalced people. In addition, it could be also possible that IDPs kept in their historical memory the sanitation campaigns in rural areas, in which one central activity was to boil the water before drinking it.

In regards to uses of water, quantitative data and qualitative data showed that water was mainly used for housework activities (e.g., washing clothes, washing up, flushing toilets),

and human consumption (cooking) and these activities have also mentioned as common uses given to water in some Colombian studies (García-Betancourt et al., 2015, Padmanabha et al., 2010, Suárez et al., 2009). In addition, IDPs referred that they use rain water for drinking, behaviour which could be related to rural customs as is described by Tran *et al* (2010) or to availability of this type of water. Similar proportions of IDPs and non-displaced households used water-filled containers as reservoirs, spare use, and also with decorative purposes (e.g., flower vases, water-plants, plants). Suarez *et al*., concluded that this practice is mediated by people's cultural perceptions about decoration given that they found that people keep flower vases inside their households as decorative items following cultural customs (2009).

Participants mentioned as a main reason to store water their distrust in the continuity of pipe water network service. This concern could be related to either unadvertised or sudden service's suspension (information which was not verified with the municipal company supplying pipe water), or to the existence of a culture of water storage, among participants, for fear of not having it. According to several authors (García-Betancourt et al., 2015, Pacheco-Coral et al., 2010, Padmanabha et al., 2010, Tran et al., 2010, Caprara et al., 2009, Suárez et al., 2009) both explanations might be related to a history of interruptions and abrupt suspensions of piped water supply in the past, and participants storing water continuously as a response to that situation. Moreover, health and education workers interviewed in this study agreed with these hypotheses as explanations of community's water storage practices. It seems also that the municipal company providing the piped water service in Armenia has improved the advertisement of warnings about suspensions in the service since 1999 (Ramirez, 2013). This information was corroborated searching in google the terms 'corte de agua Armenia, 2013 or 2014' (suspension of water service in Armenia), and at least 5 warnings in two of the most important local and national mass media were found. Two of those warnings were advertised during the months when this research took place (Quindio, 2014a, Quindio, 2014b). Nonetheless, participants from both populations claimed that there were still interruptions in the service without prior notice, and that is why they continued storing water. In addition, non-displaced participants also mentioned the cost of water as a reason for storing it, however this research did not assess

water costs. It should be noted that other authors (García-Betancourt et al., 2015, Tran et al., 2010, Suárez et al., 2009) have found that this concern has had an effect among populations of low-socio economic strata on storing water instead of paying to use it. .

Several are the reasons and motivation for people to use and store water in their households which are not comprehended totally by public health workers. There is still a need to build a dialogue to integrate dengue prevention and control activities. It is necessary also to continue the surveillance of dengue vector within households identifying its breeding sites, so the results obtained through the entomological survey in this research are explained below.

Water-filled containers and vector abundance

Non-displaced people had more containers as well as more water-filled containers in comparison to IDPs which is a characteristic also found by Nguyen *et* al (2011) when comparing high-income with low-income populations in Vietnam. Additionally, these results consist with findings presented in chapter six showing that IDPs are poorer than non-displaced people included in this study. The majority of containers within non-displaced households were filled with tap water as well as in IDPs households, however in the latter around quarter of containers were filled either with rain water or a mixture of rain and tap water. In addition, around a quarter of containers in IDPs households were either covered partially or not covered at all by the property's roof. These results might corroborate that IDPs housing is unplanned (e.g., lack of roof in the backyard area where containers are usually located) which may lead containers to be unprotected against outdoor conditions. Only small proportions of containers were covered with lids in participant households, particularly in IDPs households where the majority of containers with lids were elevated tanks which had been provided by the government. Furthermore, it seems that some containers are less used than others because participants took some time for emptying them especially in non-displaced households. In this respect, some authors (Quintero et al., 2014, Wai et al., 2012b, Arunachalam et al., 2010, Pacheco-Coral et al.,

2010) have found that containers exposed to outdoor conditions, uncovered, or unused are main sources of *Aedes aegypti* production.

When investigating about type of containers within households, there are some key points to bear in mind such as the type of containers found. In general, participants had tanks for storing water, especially cement tanks type B. Only IDPs households were more likely to have elevated tanks, and non-displaced households were more likely to have cement tanks type A. These findings might indicate differences in housing conditions of both populations, for instance, an IDPs household with elevated tank provided by the government is an indicator of the economic aid that this type of population received because of their migration status (Ministerio del Interior y de Justicia, 2011). Moreover, the existence of cement tanks type A in non-displaced households suggests they could invest more money for building these types of tank (it has more capacity for storing water). In addition, the fact that both populations had similar amount of cement tanks type B might indicate that type of tanks' design is following specific social housing guidelines implemented in Colombia. Additionally, flower vases were other important types of water-filled containers found in participants' households, and these containers had decorative purposes as it was mentioned previously in this section. It should be said that the type of settlement and housing where non-displaced urban poor populations and IDPs are living might have an effect when people opt to have plants and flowers indoors. These points are relevant when looking the results in the light of Social Determinants of Health (SDH), framework used in this PhD, because of housing and physical environment play a key role in the health of populations (Stafford and McCarthy, 2006).

Dengue vector can breed in almost any type of water-filled container or artificial collection of fresh water (Marquetti et al., 2005), and cement tanks and flower vases are common breeding sites for dengue vector (Quintero et al., 2015, Quintero et al., 2014, Wai et al., 2012b, Arunachalam et al., 2010). In this research it was found that those types of containers were positive for immature forms of dengue vector. Regarding positive containers, cement tanks were more likely to be positive in non-displaced households and flower vases in IDPs households. In terms of abundance, larvae amounts were higher

among non-displaced households, whereas pupae abundance was higher in IDPs households. Positive containers might indicate a subjacent problem with vector control within households; however productiveness of containers (reflected in pupae abundance) might be more relevant for identifying the key breeding sites and their effectiveness for mosquitoes emergence. As Wai *et al* (2012b) found in a study in Myanmar, the containers with higher amounts of larvae were not necessarily the more efficient in terms of adult mosquitoes emergence. Padmanabha *et al* (2010) found similar results in three Colombian cities where high-larvae infested containers were not the most productive ones. So, in spite of the finding that breeding sites have more larvae abundance within non-displaced households, it seems that breeding sites are more productive within IDPs households. These results are consistent with the entomological indexes and the ratio of larvae to pupae in different types of containers when comparing IDPs and non-displaced households. In the case of entomological indexes, the abundance of immature forms per household (household index) and per container in a positive household (Breteau index) is higher in non-displaced households. However, the ratio of larvae to pupae across different types of containers indicated that in IDPs households there are similar amounts of pupae and larvae, which might point out that in containers within IDPs' households dengue vector found the appropriate conditions to complete its life cycle and emerge as adult mosquito.

Some authors (World Health Organization, 2006) have hypothesized that the characteristic of a container for dengue vector productivity is not related to a container's size or even to how many similar types of it will be found in a household. It seems that the productivity of a container is related to the conditions that a container could bring to the vector in order it to grow. Therefore, distribution of pupae across containers and households does not show normality but another type of statistical distribution, which characterizes the biological selection of the vector for containers where its reproduction may be successful (Nguyen et al., 2011, Padmanabha et al., 2010, Alexander et al., 2006). In this research a special technique for sampling the vector in the pupae stage was used providing accurate information about key and productive containers. Moreover, features like indoor temperature and humidity, availability of food for immature forms, and availability of hosts for adult mosquitoes (chapter two, section one) have an influence in that biological

selection. Therefore, it seems that the inadequate housing conditions of IDPs households were providing this specific microenvironment for *Aedes* to have a successful life cycle.

However, as it was hypothesised in this research (chapter one), the availability of water-filled infested containers within non-displaced households keep pools of larvae which might serve as reserves for the vector. Although this research did not measure dengue virus prevalence in the neighbourhoods where this study took place, is not difficult to presume that those areas were also affected by dengue cases. Caprara *et al* (2009) found that larvae abundance and dengue cases occurred concurrently in low socio-economic areas of the Brazilian city of Fortaleza. Stoddard *et al* (2013) found that in certain areas in the Peruvian city of Iquitos some people who had dengue and move within those areas were bitten by mosquitoes which spread the virus among other people. In other words, some new dengue cases had not necessarily had the dengue vector in their households, rather they visited areas high vector abundance. To sum up, it seems that, environmental conditions, low socio-economic conditions, and mobility of population within the city, may restrict dengue vector production and dengue occurrence to certain areas of the city. Therefore, as it was also hypothesised in this research (chapter one) the city itself might work like a whole-complex system where the risk for people to be exposed to dengue and dengue vector may vary across neighbourhoods.

In this section, water and its relationship with dengue vector abundance in households was described. In the next section, the practices towards dengue vector and water registered by households are presented. As well as the participant's knowledge about the disease and people's attitudes towards its prevention are explained.

Chapter 7, Section 2: Practices, knowledge, and attitudes towards dengue

In this research, people's practices, knowledge and attitudes towards dengue were explored among IDPs and non-displaced populations. The findings are described in detail aiming to show similarities and differences with World Health Organization (WHO) guidelines. First, practices found in the Knowledge, Attitudes and Practices (KAP) survey, as well as in focus groups and interviews are presented. Second, the category water, diseases and dengue is explained (see Figure 35, in section one of this chapter). Third, dengue knowledge among IDPs and non-displaced populations is described. Fourth, the individual attitudes and governmental actions towards dengue are described, and finally the discussion about main findings is given.

Description of findings

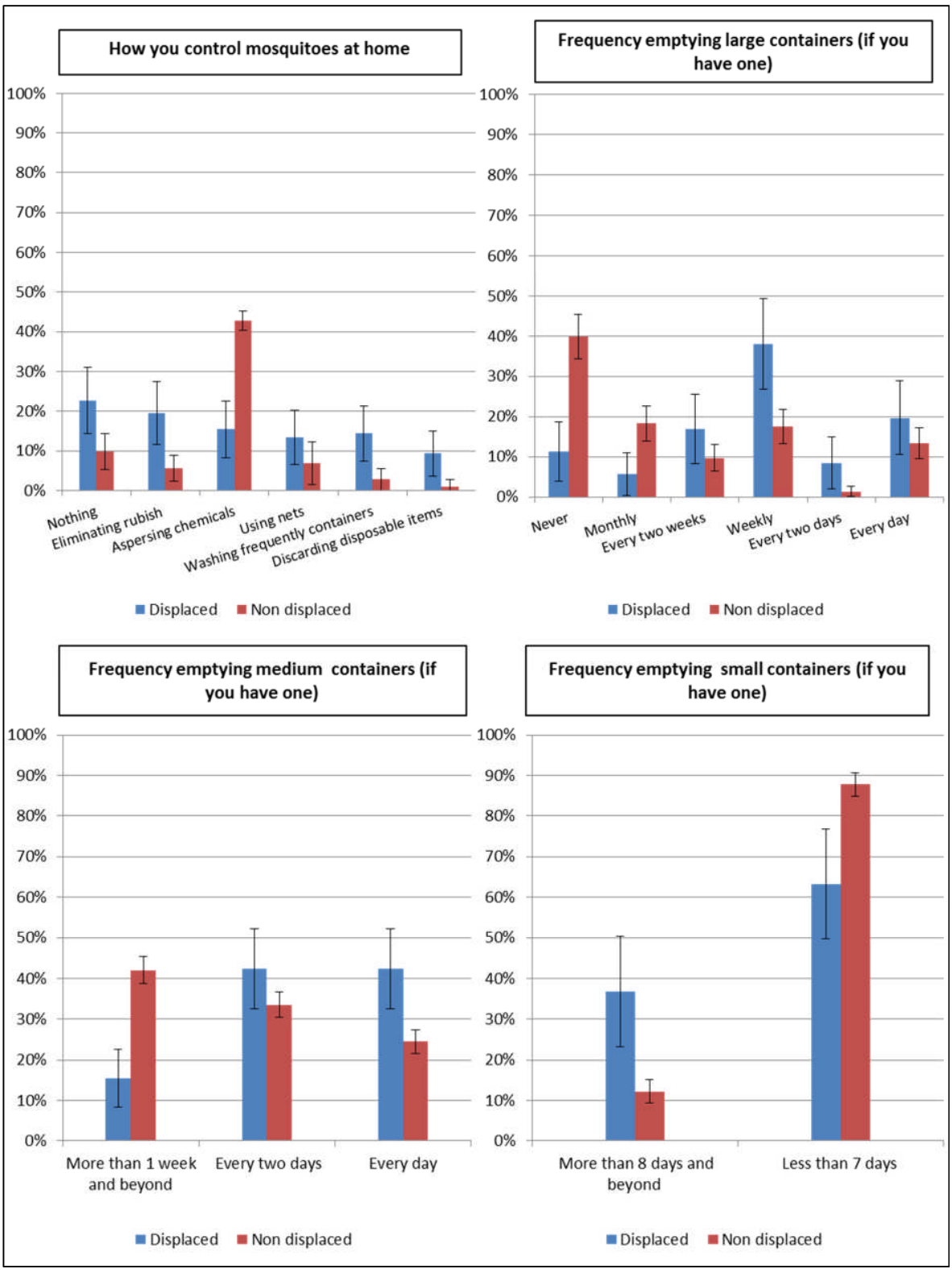
Practices

Results from the KAP survey indicated that for controlling mosquitoes at home there were significant differences among participants, for instance almost half of non-displaced people preferred aspersing chemicals whereas less than 20% of IDPs considered this option. However, IDPs acknowledged more relevant than non-displaced people, activities such as eliminating rubbish (20% vs 5.5%), using nets (13% vs 7%), washing frequently containers (14.4% vs 2.7%), and discarding disposable items (9.2% vs 0.9%) for controlling mosquitoes. It should be noted than near 20% of IDPS and 10% of non-displaced people did not consider any activity as a control of mosquitoes at home (See Figure 45). Furthermore, activities such as spreading insecticides (25.8% vs 33.2%), and covering water containers (4.1% vs 1.2%) could work as control for mosquitoes for participants.

Uncommon, practices such as applying chemicals to the water, using repellents, and educating relatives or neighbours were similar among participants, but with very small percentages of responses.

The frequency of emptying containers varies across households and also according to the size of containers. In regards to large containers (more than 200Lt of capacity), around 20% of IDPs and near 12% of non-displaced empty those containers daily. More than half of IDPs households tended to empty big containers more frequently in comparison to non-displaced households (within two weeks). It should be noted that 40% of non-displaced households did not empty them ever in comparison to 10% of IDPs. Around 80% of IDPs households emptied medium containers (e.g., metallic bins, cement tanks) within two days, whereas this practice was found in 50% of non-displaced households. Around 40% of non-displaced households take more than 1 week for emptying these containers in comparison with the ≅15% of IDPs households. Near 90% of non-displaced households emptied small containers (e.g., buckets, vases) within a week in comparison with the ≅62% of IDPs households (See Figure 45).

Figure 45 Practices towards dengue vector



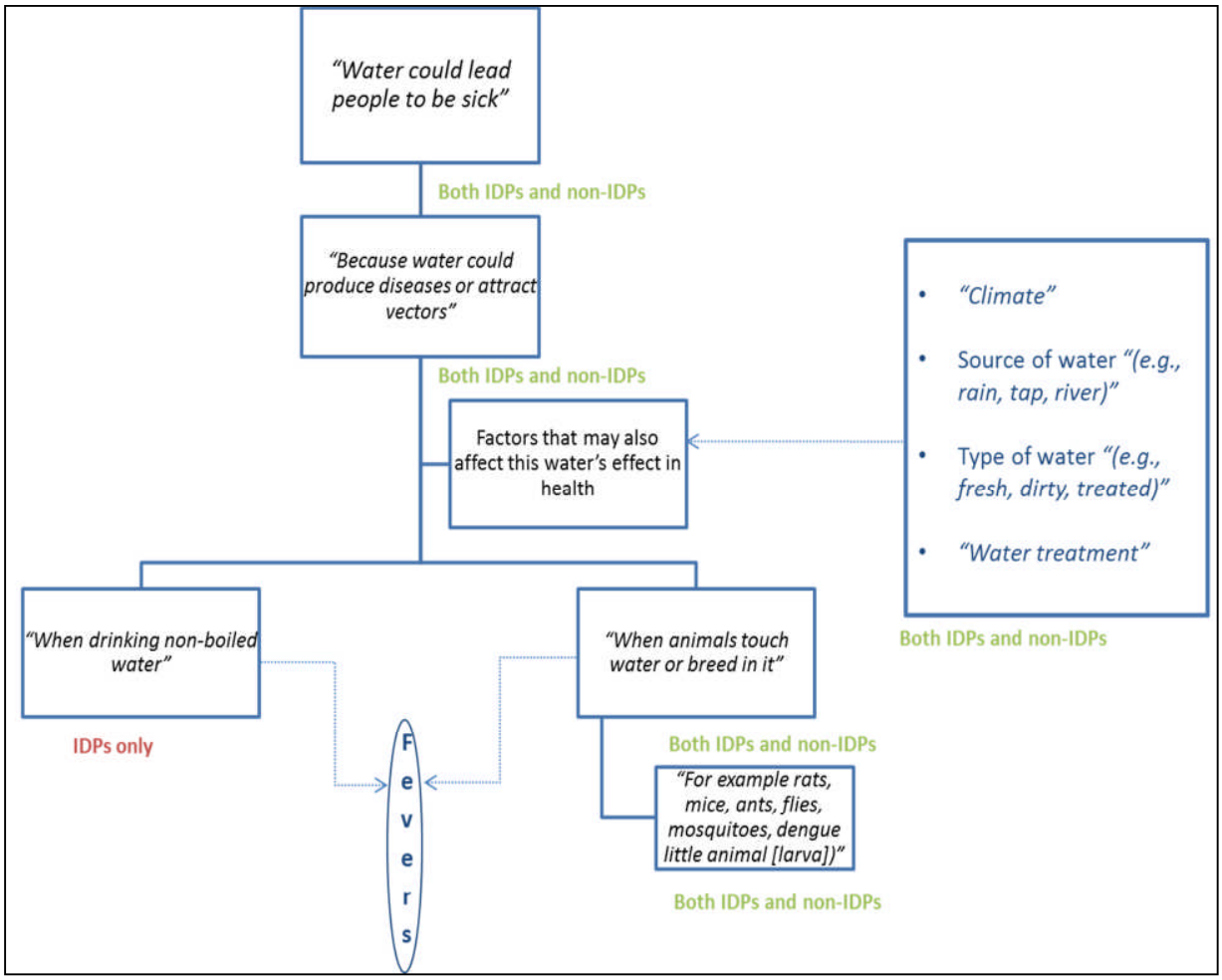
In addition, there were also practices reported by individuals in focus groups which are summarized and compared between IDPs and non-displaced people in table 21:

Table 21 Results from focus groups categorized by the author

	IDPs	Non-IDPs
Practices inside households		
Covering small containers with lids		X
Emptying the tank	X	X
Not having disposable items which could be water reservoirs	X	
Not having buckets or pots with water	X	
Washing frequently the tank	X	X
Practices in the public space		
Adequate repairs of the pipe water and sewer network	X	X
Good management of contaminated rivers and small valleys	X	X
Good service of rubbish collection and recycling	X	
Not having disposable items which could be water reservoirs	X	
Planned neighbourhoods and housing		X
Trimming grass and bushes	X	

Participants considered that practices towards water may lead to either having good health or becoming sick, and they also acknowledged that other factors might affect the relationship between water and health. In general, participants considered that water was related to the dengue vector although until this point they did not mention that dengue was they disease produced by dengue vector (See Figure 46).

Figure 46 Water, diseases, and dengue category explained by the participants



Author's own elaborated with data collected in focus groups and interviews with participants

In addition, IDPs considered that water was related to dengue vector:

> *Interviewer: What is the relevance of water in dengue? What is your opinion about water's [effect] in dengue?*
>
> P4: *As an example, when we leave tires or vasijas [small containers] where the water is collected, and the water last a lot of time there [in the small container], and then the little larva, which are the mosquito, is growing [there]* [sic] (Participant 4, IDPs discussion group 1, Armenia, 2013).
>
> *Interviewer: So is when you leave vasijas [small containers] and the collected water is exposed [to the mosquito]?*

P5*: Or says where the pipe and sewer network is damaged and all of that [stagnant water] remain there* [sic] (Participant 5, IDPs discussion group 1, Armenia, 2013).

Interviewer: So, the mosquito comes from the sewer, too?

P5*: Of course! Because the animal adapts there* [sic] (Participant 5, IDPs discussion group 1, Armenia, 2013).

P4*: Of course! Because that [the sewer] has a rack but the water still is collected there* [sic] (Participant 4, IDPs discussion group 1, Armenia, 2013).

P6*: Or [in] a broken pipe in a neighbour [house]* [sic] (Participant 6, IDPs discussion group 1, Armenia, 2013).

P7: *Or [in] the plants ... there also the mosquitoes [can] breed* [sic] (Participant 7 IDPs discussion group 1, Armenia, 2013).

For non-displaced people water and dengue vector have a relationship, but to suffer dengue was not directly related to water or its storage rather to other factors like poverty, which is an emergent category:

P4*: Dengue [occurs], as always, because you are poor. In my understanding [dengue is related to] a non-good cleaning [practices you] have with the tank or lavadero, or if [you] leave everywhere cocos [small containers] filled with water during some days. Then, I will say someone in that house is going to be sick of dengue, but in my house [that situation] does not happen because each tank is clean and there are not cocos filled with water* [sic] (Participant 4, non-displaced focus group 1, Armenia, 2014)

Interviewer: What do you think?

P3*: Yes, all the things P4 says are true, you should not have cocos with water nor tyres. If I have plants with water, I change the water because you [should] be changing that* [sic] (Participant 3, non-displaced focus group 1, Armenia, 2014)

P2*: Washing the tank every two days* (Participant 2, non-displaced focus group 1, Armenia, 2014)

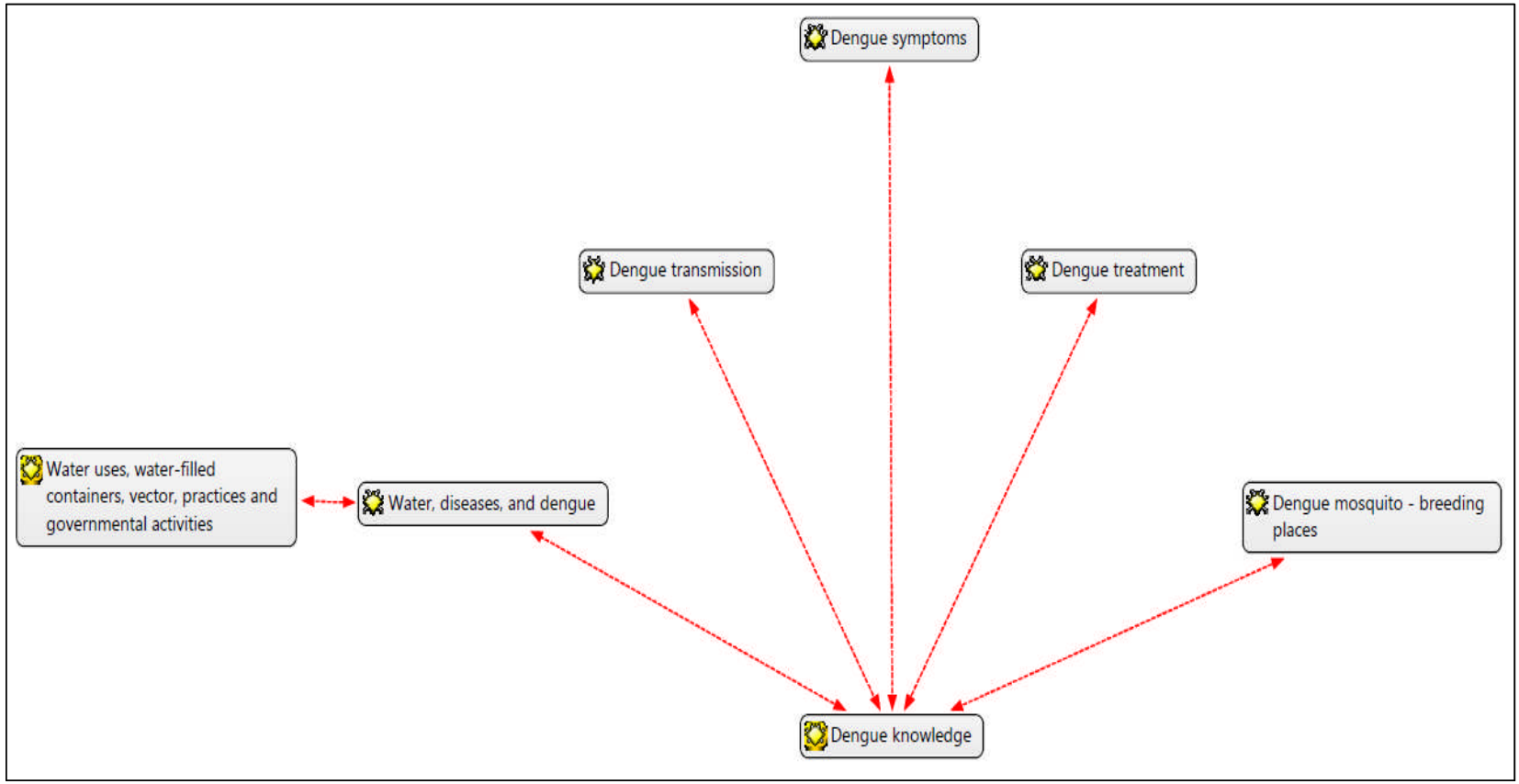
P1*: Washing the tank, but if you cannot do that every two days as you (P2) say, so [you should] keep it covered, because mine is also exposed to rain water... In my house you see a lot of mosquitoes, but we have never been sick* [sic] (Participant 1, non-displaced focus group 1, Armenia, 2014)

Until this point of this chapter, it was exemplified how people managed water within households as well as and how they did certain practices towards dengue vector. Results indicated superficially motivations of people to behave in certain way. However, it is necessary to confirm whether these practices are consisted with knowledge about dengue as well as attitudes and perceptions towards its prevention and control.

Knowledge

Qualitative data indicates that in general non-displaced people and IDPs have similar knowledge towards dengue, but there are certain mistakes in knowledge with regards to dengue classification, severity, and treatment. Figure 47 shows categories of dengue knowledge obtained from focus groups with IDPs and host people:

Figure 47 Knowledge categories explored among participants, linked with some practices



Furthermore, different people's empirical knowledge came out during the focus groups and interviews and I classified them in emergent categories which are listed in table 22.

Table 22 Emergent categories found in interviews and focus groups

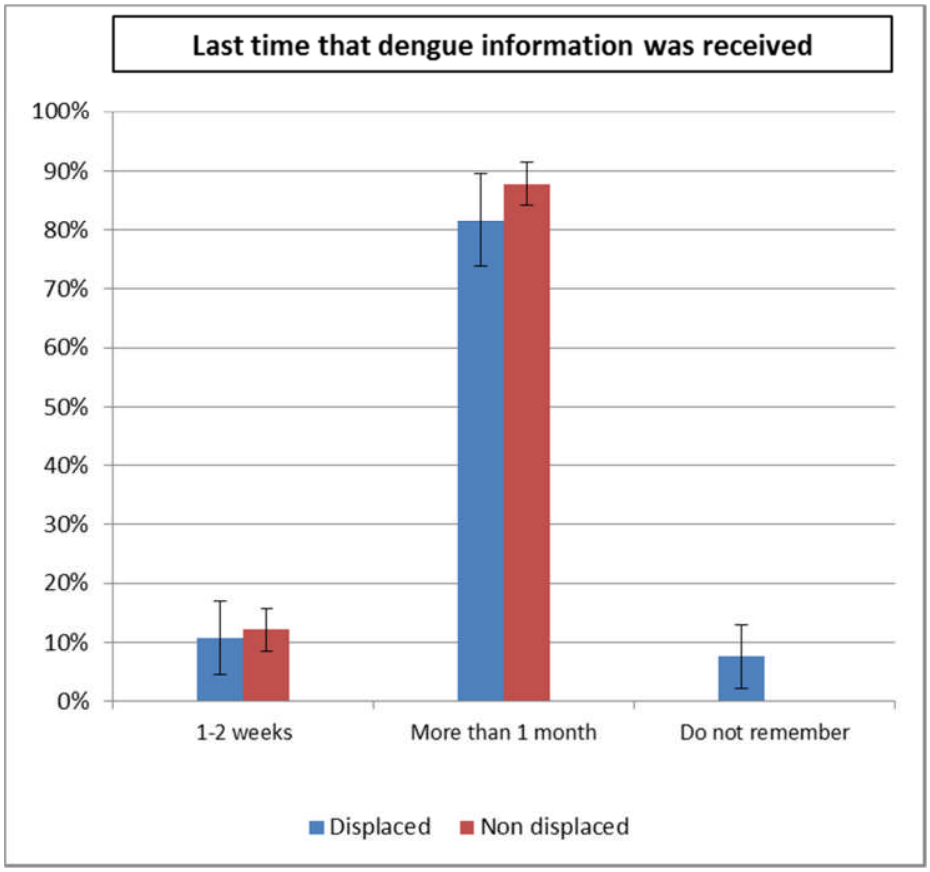
Topic	Emergent category	Type of focus group
Dengue	Dengue and cities	Both IDPs and non-displaced people
	Dengue and poverty	Non-displaced people
	Dengue, climate, and environment	Both IDPs and non-displaced people
	Dengue and other fevers	Both IDPs and non-displaced people
Migration	Migration and diseases	IDPs
	Migration and fevers	Both IDPs and non-displaced people
	IDPs and diseases	IDPs

Only two categories are reviewed in detail in this chapter, first dengue and poverty which was previously mentioned and explored in practices. Second, the category dengue and other fevers described in detail elsewhere in this chapter.

Delays and successes in receiving dengue information

More than 50% of the participants had received dengue information within a period ranging from one month to more than six months before being surveyed, but a small percentage reported that they obtained dengue information within two weeks before answering this survey (See Figure 48).

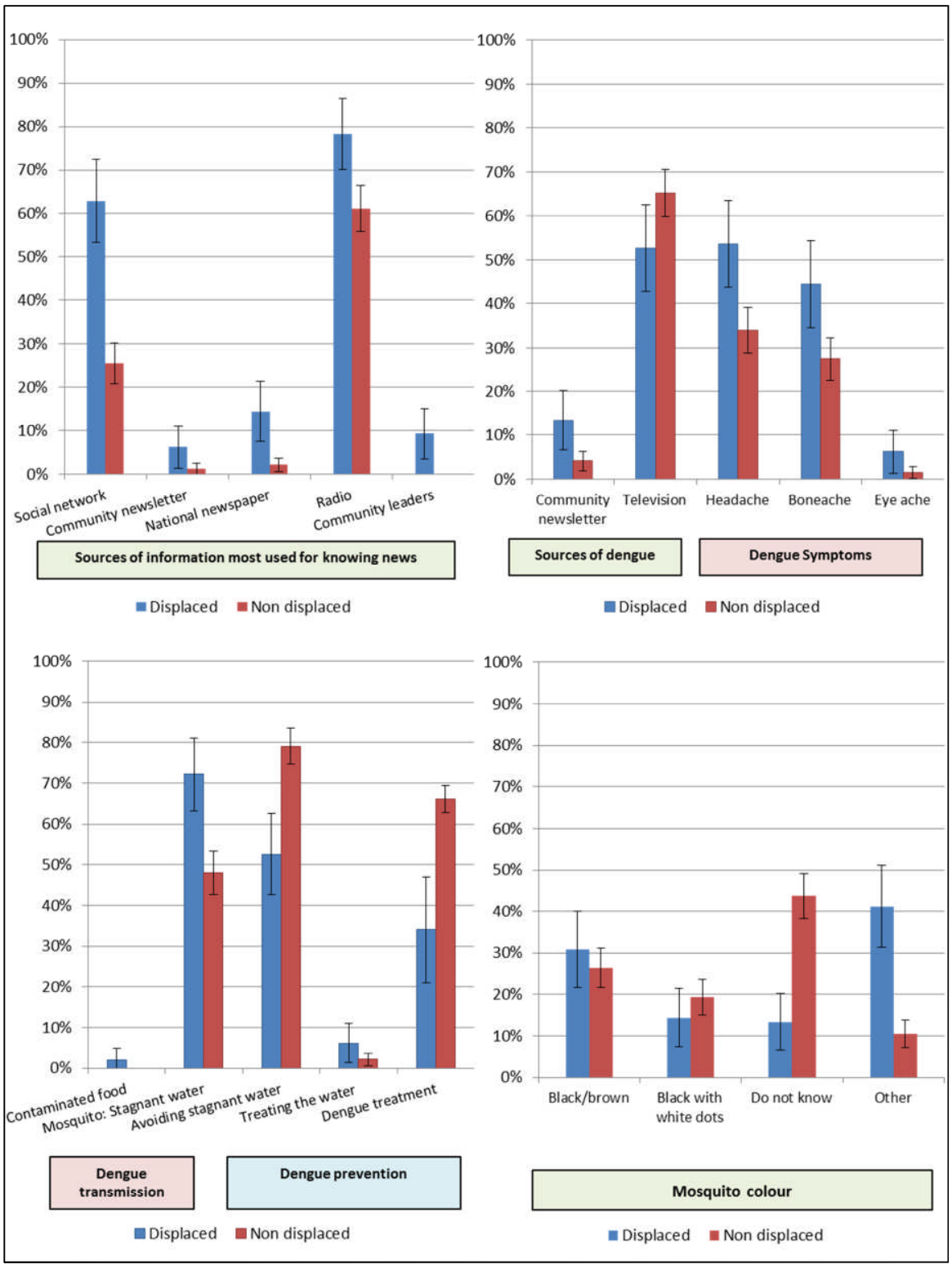
Figure 48 Time-periods in which participant's received the last dengue information



Sources of information and dengue knowledge

In general, KAP survey's results indicated that participants watched television for being informed of news (90%). However, among displaced populations the role of information sources such as radio, social networks, community, and national newspaper was more relevant in comparison to non-displaced populations (See Figure 49). More than 90% of the participants knew about dengue through the same sources of information showed in figure 51, but 11.5% of non-displaced people referred to know dengue through educative institutions in comparison to 5% of IDPs (See Figure 50).

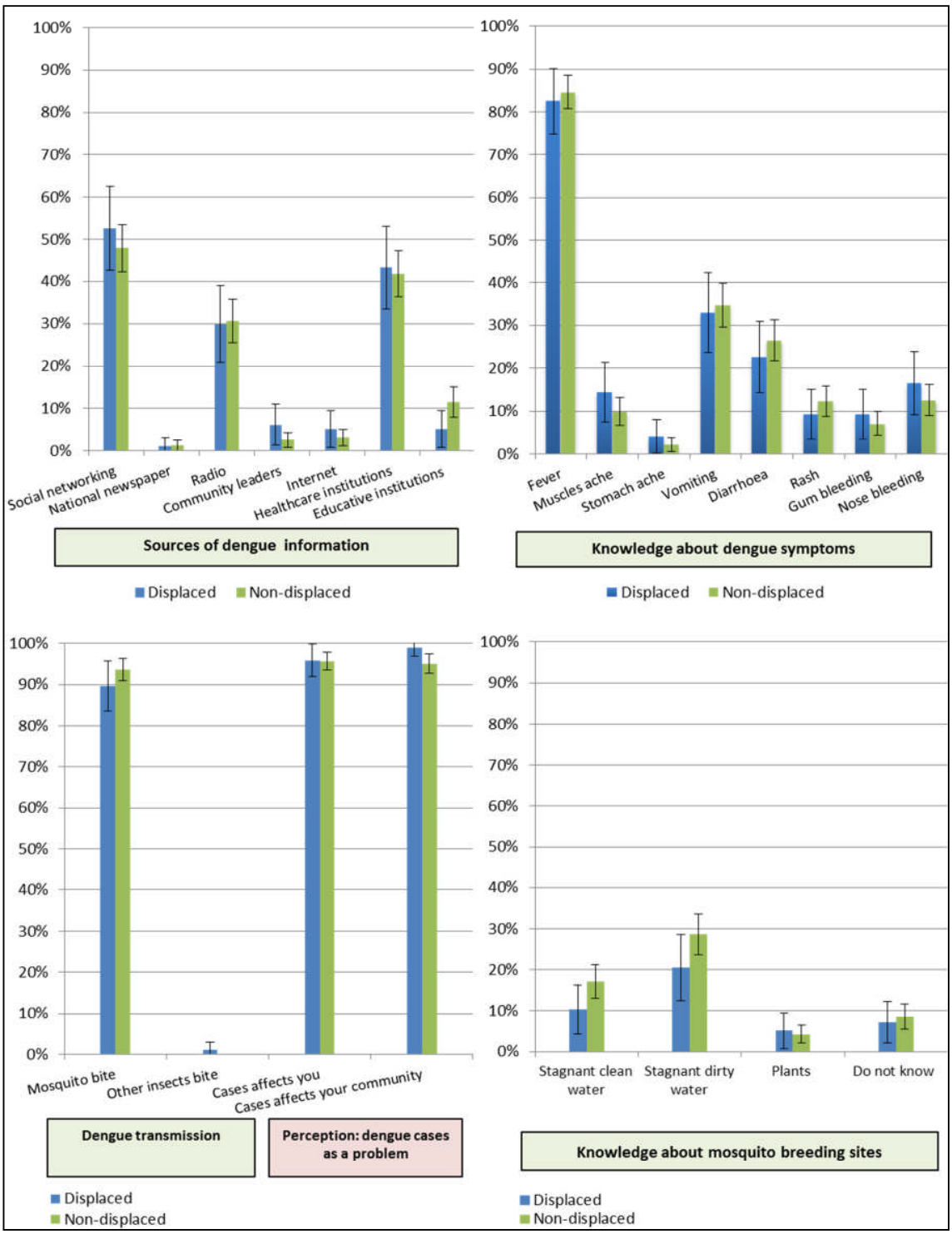
Figure 49. Sources of information used and participants' dengue knowledge significantly different



Dengue knowledge: symptoms and treatment

IDPs and non-displaced participants could identify as symptoms of dengue headache (54% vs 34%), bone ache (44% vs 27%) and eye ache (6% vs 1%) (See Figure 50). Moreover, participants could identify fever (83%), vomiting (≅34%), and other mild discomforts as dengue symptoms, but less than 20% of participants had knowledge of symptoms related to severity such as nose and gum bleedings, and stomachache. These results did not show significant differences (See Figure 50). More than 90% of the respondents considered that dengue cases might affect them or their communities, and they also had concerns of being affected by their neighbourhood's cases (See Figure 50).

Figure 50. Similar dengue knowledge among participants



p

Similar perceptions were found in the qualitative data. Although nearly 85% of the survey respondents are aware of common dengue symptoms, they did not recognize the more severe ones. In this respect, a non-displaced woman affirmed in a focus group:

> *This dengue is one of those diseases that may be, should [display] a lot of symptoms for you to suspect that is [indeed] dengue* [sic] (Participant 2, non-displaced focus group 1, Armenia, 2014).

Additionally, 34% of IDPs versus 66% of non-displaced mistakenly think that dengue has a treatment. Qualitative data showed that non-displaced people consider paracetamol and other analgesics' shots provided in healthcare facilities as a treatment of non-severe dengue. Participants knew that they would need abundant liquids in case they suffer dengue. Same results were found in the focus group done with IDPs-indigenous authorities, but any comment about dengue treatment was raised in other IDPs focus groups. Qualitative findings of participant's knowledge about dengue treatment are displayed in table 23:

Table 23 Participant's knowledge about possible treatments for dengue

Non-displaced focus groups				
	Paracetamol/ Oral rehydration	Hospital/ Emergency	Plants/ Traditional doctor	Treatment at home
Non-severe dengue	X			X
Severe dengue		X		
Children		X		
Adult	X	X		X
City	X	X		
Countryside			X	X
Indigenous-IDPs focus group				
	Paracetamol/ Oral rehydration	Hospital/ Emergency	Plants/ Traditional doctor	Treatment at home
Non-severe dengue	X		X	X

Severe dengue		X		
Children		X		
Adult	X	X		X
City	X	X	X	X
Countryside			X	X

In the KAP survey, almost 100% of the respondents said they would seek healthcare facilities when they recognized dengue; however, qualitative findings show that people considered non-severe dengue as a part of a group of other mild viral fevers and prefer to treat it at home. Moreover, non-severe dengue does not represent a threat for people's health whereas severe dengue can lead to death:

> P3: *Because [it is] said that there are two types of dengue: classic and haemorrhagic; classic [dengue] produces you to have headache but that is normal. Then, many people [who] suffer that [type of dengue], can also have haemorrhagic dengue* [sic] (Participant 3, non-displaced focus group 1, Armenia, 2014)
>
> P2: *But that one [classic dengue] lasts just three days, and then you do not feel sick anymore... However, the problem with the other dengue [haemorrhagic] is that you in three days can die faster* [sic] (Participant 2, non-displaced focus group 1, Armenia, 2014)
>
> P1: *And you take medicines and do not feel better at all* [sic] (Participant 1, non-displaced focus group 1, Armenia, 2014)

Dengue transmission

In general people know that dengue is transmitted by a mosquito bite (82% of displaced people vs., 95% of non-displaced people), and a small proportion of IDPs relate dengue spreading with other insects bite (See Figure 49). Fifty three percent of displaced people and 79% of non-displaced people ($p<0.005$) related the mosquito's breeding sites with stagnant water, and around 18% of the participants specified that the mosquito preferred stagnant clean water for breeding (see Figure 49). Similar perceptions were found in the qualitative data. Moreover, near 40% of non-displaced people reported that they could not

identify the mosquito by its colour, however the same percentage of IDPs described a wrong mosquito's colour (see Figure 49). According to the qualitative findings, it seems that people had mistaken knowledge because they knew about different types of mosquitoes, and they tried to relate their own experience with the information received from health workers:

> P8: *In regards to the little animal spreading dengue there are two types of mosquitoes, [one is] the 'ventor' which is very small, it turns its legs upside down, and [its shape] is curve; this is the one which produces dengue. [The other one] is produced in the sewer and it has big wings; that one is not dangerous, the dangerous is the small one* [sic] (Participant 8, IDPs discussion group 1, Armenia 2013).
>
> P9: *I have read in the health newsletter that the big mosquito 'Felix felido' [Anopheles], whatever is its name, is the one to produces dengue* [sic] (Participant 9, IDPs discussion group 1, Armenia 2013).
>
> P10: *The [mosquito] of dengue is the small one... [But] I have been bitten by a big one and I have felt like heat there [in the bite site]; that [big] mosquito is the one that go out from the sewer* [sic] (Participant 10, IDPs discussion group 1, Armenia 2013).

Dengue prevention

There was a significant difference regarding dengue prevention between both populations, and then 80% of non-displaced people said that they should avoid having stagnant water in comparison to 50% of IDPs. A small percentage (≅15%) of IDPs also considered that they should treat the water (See Figure 50). With regards to the difference in these percentages, participants in different IDPs focus groups gave as possible explanations:

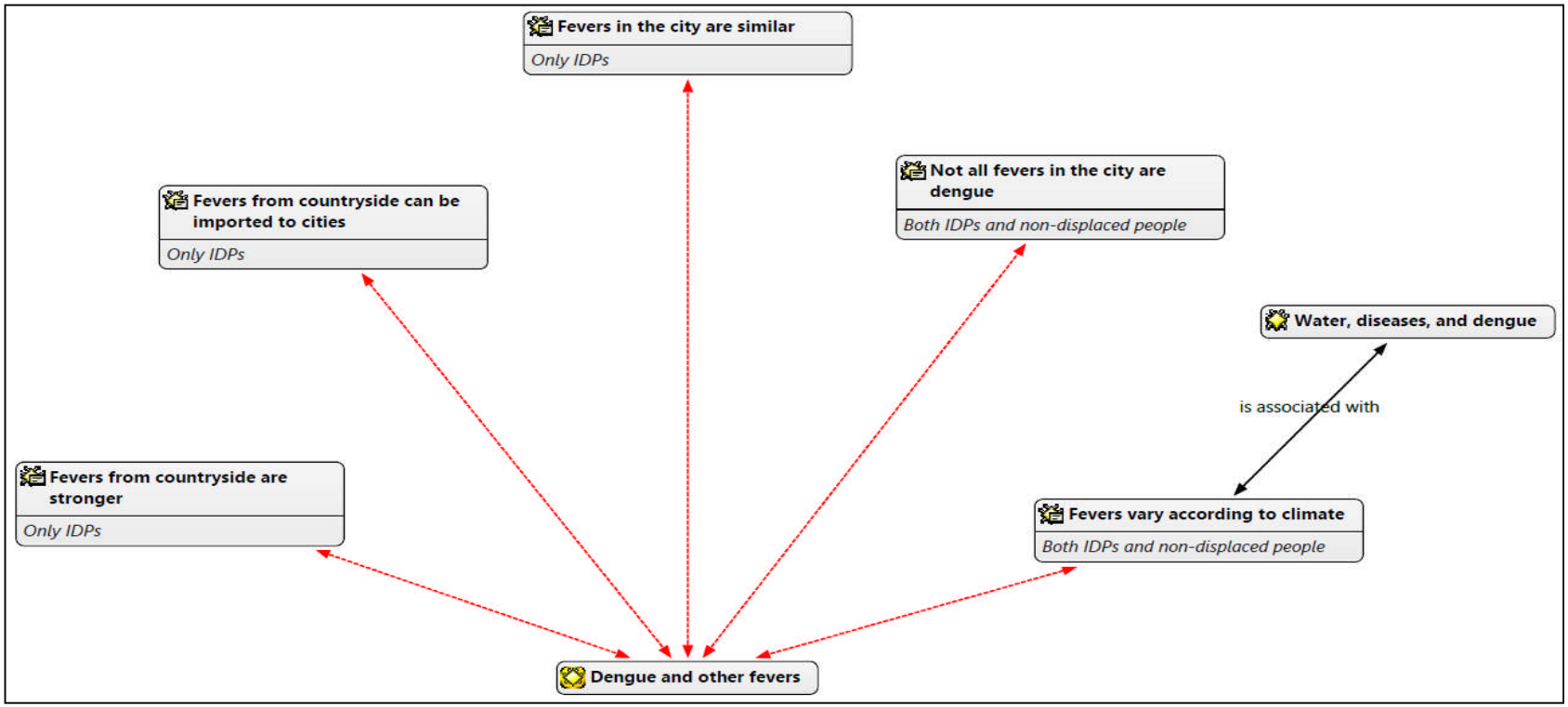
> *The water of this place [Armenia] is not treated... and when the water is not treated you need to boil it; also, as this sir was saying, you should not use the stagnant water or the container where the water is stored. Because of there are many things that both people from the city and the countryside do not do; there are not too many [people] following recommendations [about water storage]* [sic] (Participant 7, IDPs discussion group 1, Armenia 2013).

> *With these [recent] indigenous-IDPs we need to go, to look how they are doing that [managing the water], and to teach them; because of this problem of dengue, in this moment is spread [here], we need to talk with them about cleanliness, boiling the water for drinking, washing the hands before eating, washing the fruits and vegetables*...[sic] (Participant 1, IDPs focus groups 1, Armenia, 2013).

Emergent category: Dengue and other fevers

In the different focus groups with IDPs and host populations the topic of fever was mentioned and described by the participants several times (See Figure 51). For both IDPs and non-displaced people was clear that dengue was one type of fever occurring in urban areas, but for IDPs endemic fevers, in urban areas, had similarities with each other. Furthermore, for participants from the two groups fevers occur in specific climates. This category was related to 'water, diseases, and dengue' which was described previously in practices. Only for IDPs, the fevers occurring in rural areas were stronger than those endemic in cities, and those fevers could be imported into the cities as well.

Figure 51 Emergent category: dengue and other fevers



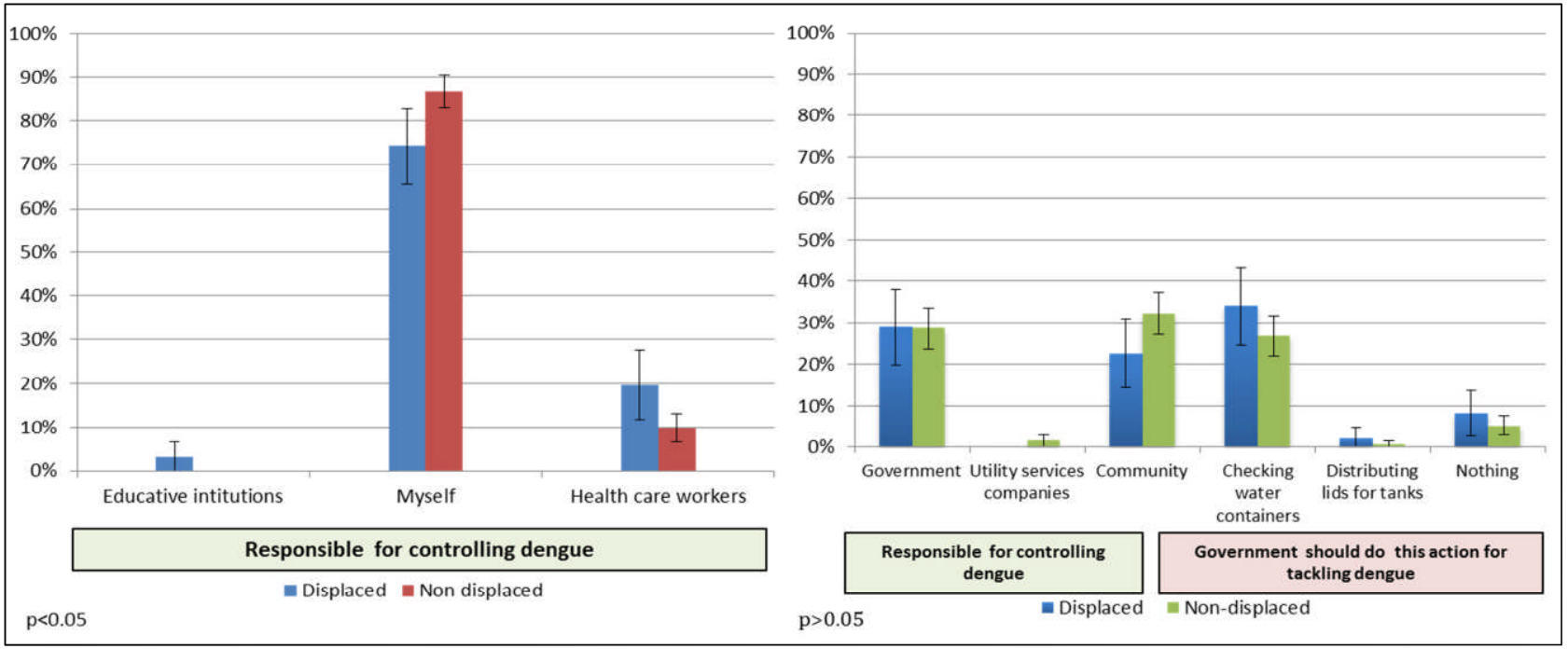
Attitudes

Attitudes towards dengue: individuals, community and institutions

More than the half of the participants considered that they were responsible for controlling dengue, and near 30% of them considered that community and government were also responsible. Less than 10% of non-displaced people considered that utility service companies had a responsibility of tackling dengue (See Figure 52), and a similar percentage of IDPs considered that educative institutions shared the same responsibility (See Figure 52). Perceptions about a shared responsibility among different social actors obtained from focus groups were similar to the quantitative findings:

> P1: *If you go now to the hospital X there is a dengue spreading [which] has not seen previously... So, this [dengue] information is not worthy because the majority of the cases are in the hospitals, and it is known that there [in the hospitals] is [where] the transmission [happens]... Now, [here in Armenia] there is not any neighbourhood without two or three cases* [sic] (Participant 1, in IDPs discussion group 1, Armenia, 2013)
>
> P2: *Well, but also is this situation that we do not care about ourselves either, [doctors] give us the recommendations... People are given a lot of recommendations, but anyone does nothing* [sic] (Participant 2, in IDPs discussion group 1, Armenia, 2013)
>
> P1: *I do not agree... Because I tell you, the mosquito does not remain in one place it flies... Then it bites a person, which is infected, then it bites another person and that person is [now] infected, and that process continues* [sic] (Participant 1, in IDPs discussion group 1, Armenia, 2013)
>
> P5: *Because [public health workers] say to you do not put water in the flower jars, tires [and] containers, but I would say that the small valleys [within the city] also produce little ponds. I guess that those small valleys leave stagnant water and in this [water] the animals [can] breed* [sic] (Participant 5, in IDPs discussion group 1, Armenia, 2013)
>
> P3: *Miss, the problem is the small valley in the neighbourhoods X and Y, and this small valley is contaminated, and from there many animals come out; rats, big rats and mosquitoes come out [from there] even bad odours, because it seems that the small valley is a sewer. So, the governor or the Mayor [should] pay attention to that [problem]* [sic] (Participant 3, in IDPs discussion group 1, Armenia, 2013)

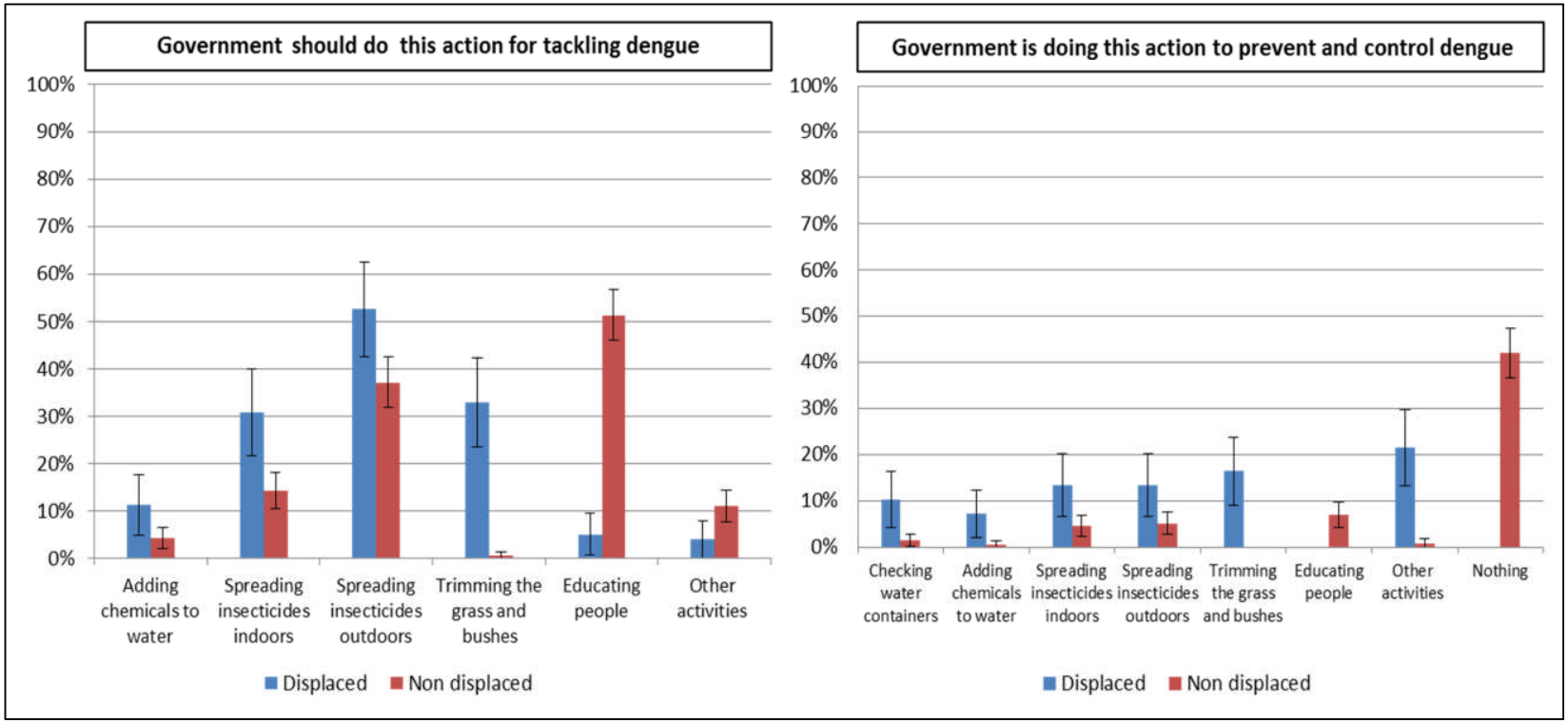
Figure 52. Attitudes toward dengue among participants



Ideas and perceptions about governmental activities towards dengue control

The KAP survey revealed that for both groups of participants insecticide spreading was considered important for controlling dengue (IDPs >31% vs., non-displaced >14%). Moreover, 50% of non-displaced people were more likely to recognize educative campaigns as largely relevant, whereas 30% of IDPs were more likely to favour trimming the bushes and treating the water ($p<0.05$) (See Figure 54). Nevertheless, 40% of participants acknowledged they did not know about the current activities developed by the government, and a small proportion (<20%) of IDPs could summarize some of those activities (See Figure 53). Perceptions found in qualitative analysis show similarities to the summarized quantitative findings. Around 30% of the participants considered important the government's revision of water containers for controlling dengue, and this result was not significant (See Figure 52).

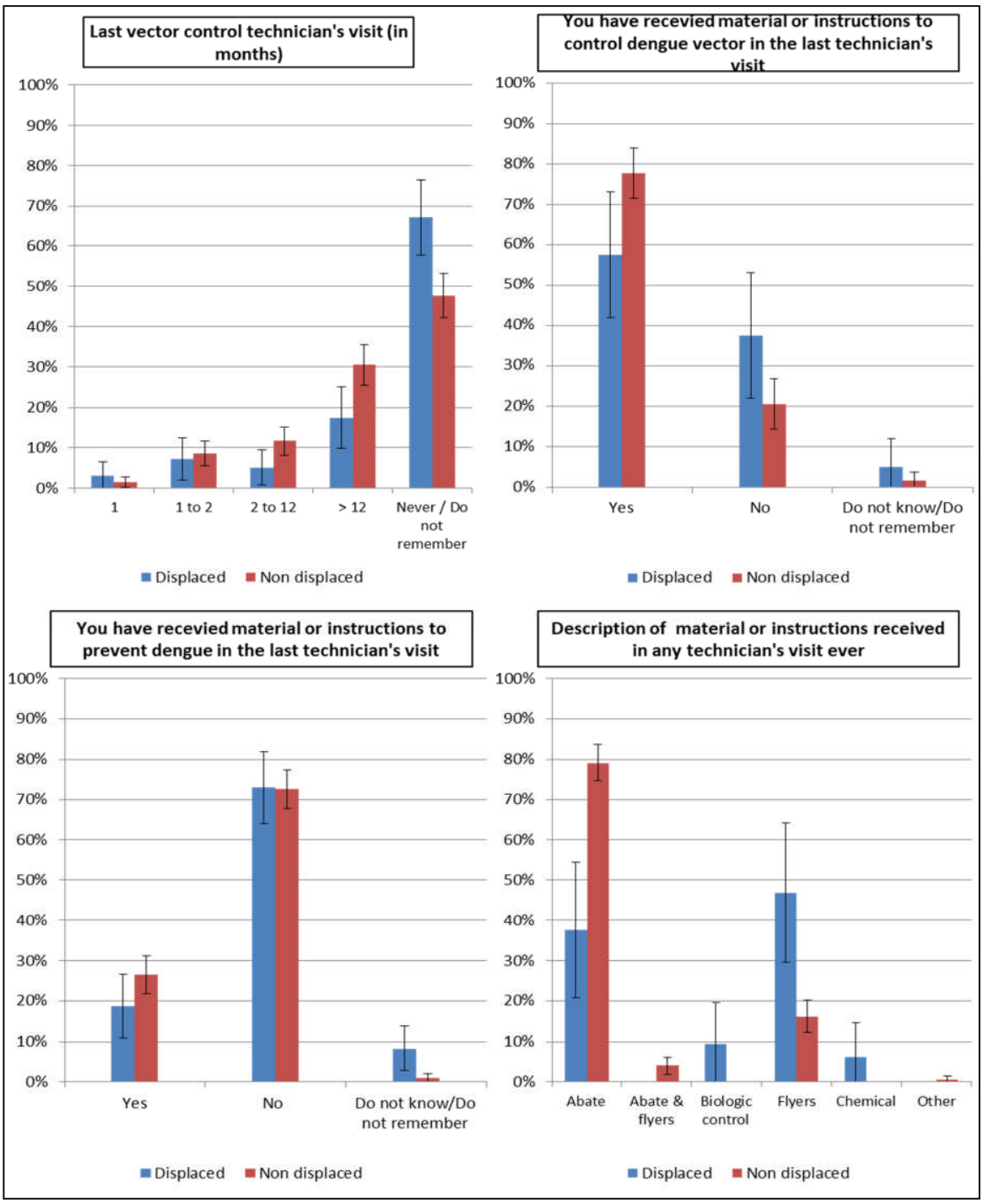
Figure 53. Significant attitudes towards dengue among participants



Current governmental activities towards dengue's vector control acknowledged by participants

Data from the KAP survey indicated that within the previous year near 32.9% of IDPs households and 52.3% of non-displaced ones have been visited by vector-control technicians. In that visits, almost 60% of IDPs and near 80% of non-displaced households received material for controlling the mosquito and around 20-25% in both populations was instructed in dengue prevention. Around half of IDPs household specified that they received informative flyers in comparison to 15% of non-displaced households, and almost 80% of non-displaced households and less than 40% of IDPs received Abate® to use it in containers. Only ≅5% of non-displaced households received Abate® and flyers, and in near 15% of IDPs household chemicals and biologic control were provided by the technicians (See Figure 54).

Figure 54 Participant's perceptions about governmental activities



In addition, qualitative results from interviews of people working with IPDs revealed there were several current governmental activities for preventing and controlling dengue:

> *I can tell you about the campaigns that health authorities do, [for instance] covering the wells, covering the tanks, [also I can tell you about] the campaigns they do for preventing dengue. Indeed, they [health authorities] post adverts in the health centres, in the Mayor's office, and they do other campaigns in other places to prevent dengue* [sic] (Interviewee 5, working with IDPs, Armenia, 2013).

Activities done during the health staff visits to mainly IDPs households were described by a nurse:

> *[When visiting households we give] flyers, [we do] talks for the community, [also] vector division coordinators go [to these visits] and check the tank, they take samples from the water... And also [we do] education* [sic] (Interviewee 2, working with IDPs, Armenia, 2014).

Moreover, IDPs acknowledged the work of health staff in order to develop vector control activities in their neighbourhoods:

> P4: *Yes, health people have visited house per house looking for the little animal [larva] and they have found it. [That is why] I try to avoid those little animals not having stagnant water in bottles or other [items]* [sic] (Participant 4, IDPs discussion group, Armenia, 2013).

> P5: *I think that with this [dengue] problem there is an important factor, because when they [health workers] do the visits, they talk [among them], and they count certain amount of houses and they visit only some households. Says that with that observation [health workers only consider] some households which fairly accomplish the water change [emptying water-filled tanks], but the space [houses which are not visited] is wide... I think that is not and adequate process* [sic] (Participant 5, IDPs discussion group, Armenia, 2013).

So, it seems that IDPs have been targeted by public health activities towards dengue control in Armenia. However, this topic was not addressed in focus groups of non-displaced people participants.

Discussion

Summary

This section summarizes practices, knowledge and attitudes towards dengue among non-displaced and IDPs. IDPs seemed to have good practices towards dengue control in comparison to non-displaced people. In spite of this, non-displaced did not feel at risk of suffering dengue because they related dengue acquisition with poverty. Participants could reach the main mass media to obtain general information and to know about dengue, however IDPs could not obtain dengue knowledge through educative institutions, and relied more on community networking to be informed about dengue. Furthermore, the majority of participants knew about dengue and some of them had received recent information, but they had mistaken knowledge about disease severity, treatment, and transmission. Moreover, participants recognized their role in preventing and controlling dengue, as well as the relevance of governmental and multi-sectorial participation. Although participants had information about some of the dengue prevention and control activities developed by the government, participants give more relevance to the activities they thought the government should be doing to tackle dengue. This might be also related to a lack of community engagement activities in dengue control.

Explanation of findings

Practices

Regarding how participants controlled mosquitoes in their households there are certain differences to highlight, for example non-displaced people considered as the best option was aspersing chemical products (e.g., insecticides). However, for IDPs that type of control represented only one way to control mosquitoes as they also mentioned other options. Washing frequently water-filled containers was mentioned by IDPs but was hardly acknowledged by non-displaced people. These findings might point out issues in the application and sustainability of all the components of the Integrated Management Vector Control Strategy (IMS) in Armenia. If non-displaced people acknowledged predominantly chemicals' use for controlling dengue could be because they have only received ®Abate for water-filled tanks without any educative activity. Regarding this possible explanation, that

situation was also described by a study done in La Dorada, Colombia (Pacheco-Coral and Martínez-Parra, 2013). Another explanation could be that non-displaced people only recalled the use of insecticides for killing adult mosquitoes, and using insecticides as a governmental measure is restricted for dengue epidemics and not as a routinely activity of prevention and control (World Health Organization, 2012). The study in La Dorada (Pacheco-Coral and Martínez-Parra, 2013), found that the community participation intervention suffered several interruptions, due to a lack of economic resources and several political changes in the municipality. As a result, people did not have good attitudes and practices towards dengue control. Studies in Cuba have shown that the continuity in this type of interventions represents a sustainable and cost effective tool, for preventing and controlling dengue in comparison to vertical interventions (e.g., chemical-exclusive campaigns) (Toledo et al., 2007, Toledo Romani et al., 2007). In addition, whether non-displaced households bought insecticides for private use might reflect differences in their socio-economic conditions in comparison with IDPs households, because non-displaced people (participating in this research) should have enough economic resources to afford the cost of insecticides.

IDPs were more likely to empty large containers frequently compared to non-displaced people. The pattern of emptying large and medium water-filled containers (or not doing that) in non-displaced households was also described by Padmanabha *et al* (2010) in a study done in three Colombian cities including Armenia. The authors considered that this behaviour was mediated by people's perception of the average temperature of Armenia when comparing results there with findings from the other cities. It is possible that non-displaced people changed their behaviour towards emptying containers according to the variation in the local climate. Nevertheless, these might not apply for IDPs who had fewer amounts of water-filled containers and probably they used the stored water for their needs. Conversely, small containers were emptied faster in almost all non-displaced households (less than one week) than in IDPs households. Results from the Colombian study (Padmanabha et al., 2010) indicated that in Armenia the larvae infested water filled containers were more likely to produce pupae when they were not emptied, and this outcome was different in the other two cities with higher temperatures. So, the authors

hypothesised that the temperature of the city in combination with the pattern of emptying also mediated the productivity of water filled-containers. As it was mentioned in chapter two, section two *Aedes aegypti* production could be enhanced by small changes in temperature if its breeding site is adequate. This research has pointed out that IDPs housing conditions were inadequate, and this may influence the occurrence of small changes in indoors temperatures. Temperature changes in addition to a less emptying frequency of small containers might explain why flower vases produced more *Aedes* within IDPs households.

Additional information obtained through qualitative methods indicated that people were also concerned about practices for controlling dengue vector which take place in the public space. Good practices towards dengue control such as disposable material that could be recycled were mentioned only by IDPs. Other practices such as environmental sanitation was also mentioned. Participant's perceptions about these practices in relation to dengue control might be influenced by the sanitation campaigns which took place across Colombia mainly controlling malaria mosquitoes (Hernández et al., 2002). It should be noted that an adequate maintenance of sewer and pipe water's networks was relevant for both populations, also an adequate planning of housing and neighbourhoods was mentioned only by non-displaced people. These findings pointed out that people acknowledged housing and urban planning as potential factors related to dengue vector. A recent study in Colombia considered that unplanned settlements might influence dengue vector abundance but when considering the city as a whole and assessing concurrently social and ecological determinants (Fuentes-Vallejo et al., 2015). Moreover, housing is considered a SDH for other Neglected Tropical Diseases (NTDs) affecting specially poor populations (Aagaard-Hansen and Chaignat, 2010), therefore it is possible that housing also has an effect in determining dengue among the urban poor. Finally, both populations agreed that depending of the practices they had towards water, they were more or less likely to be sick. For dengue, both IDPs and non-displaced people considered that good practices towards water use and storage helped them to avoid dengue vector. However, for non-displaced people this a preventive practice, because for them dengue was a disease related to poverty. Some studies found that people mistakenly thought that mosquitoes breeding

sites are located in poor areas where people live in unhygienic conditions (Caprara et al., 2009, Suárez et al., 2009). This might lead people, who do not consider themselves as poor or unclean, not to consider themselves at risk of acquiring dengue. In addition, as it was explained in chapter two, section two the history of disease control showed how the 'fevers' in Colombia were related to certain areas of the country. Furthermore, according to the rural-urban migration patten explained in chapter two, section three it is possible that people living in cities related diseases to migrants who come from areas endemic for diseases such as dengue or malaria. Nonetheless, dengue is currently considered as a disease of poverty by the World Health Organization (World Health Organization, 2015b), so these results may point out that even communities recognized that people in underprivileged conditions are more vulnerable for acquiring dengue.

Knowledge

The facts that more than the half of the participants obtained dengue information with a delay, and that non-displaced people did not receive any recent information corroborate the hypothesis of potential interruptions in the IMS in Armenia. Nevertheless, around a quarter of the participants had heard about dengue recently, and this finding might coincide with the rise of dengue awareness campaigns during the epidemic in 2013. Therefore, it seems that campaigns during epidemics were continuous and showed short-term effectiveness, which was also corroborated in the qualitative results. Nonetheless, this research did not measure the impact of IMS (especially in its component of community participation intervention), so it would not possible to conclude that the IMS in Armenia has been successful or not.

A greater number of the KAP survey respondents had access to mass media especially television, and they could keep informed through media, and these results has been also found by some authors (Quintero et al., 2014, Pacheco-Coral et al., 2010, Quintero et al., 2009, Pérez-Guerra et al., 2005, Ávila Montes et al., 2004). However, displaced people communicated news through community networks. The results point out that IDPs are

organized as communities as was mentioned before (chapter six, section two). A research about migration from South and Central America to United States (Ormond, 2013) has found that migrants tried to use social networking aiming to obtain guidance and orientation in regards to health issues. Such social networking is developed among other migrants from the same country or from similar regions; as well as with co-nationals related to healthcare area back in their countries of origin. In addition, non-displaced populations were more likely to gain dengue knowledge through educative institutions. This finding may indicate that city's schools are playing a key role in communicating dengue knowledge among non-displaced people. On the one hand, some authors have found that the schools are good settings for implementing community participation interventions, and as a result participants have reached good dengue knowledge (Heintze et al., 2007, Madeira et al., 2002). On the other hand, Heintze *et al* (2007), reviewed several studies done for communicating dengue knowledge in schools, and they found that a half of those studies did not show significant differences between the people who received the intervention and those who were not. Yet, in this study it seems that schools are key institutions for spreading dengue knowledge only among non-displaced populations, and this situation could represent a missed opportunity for raising awareness of dengue among IDPs because they have difficulties to access the education system. Finally, non-displaced people were not aware of news from community sources, but community's leadership and newsletters had a small contribution in their acquisition of dengue knowledge.

In general, results indicate that participants have similar knowledge with certain inaccuracies. On the one hand, the KAP survey showed that for people it was clear the typical symptoms characterizing dengue. However, IDPs were more likely to identify those symptoms than non-displaced people. Qualitative data showed that for non-displaced it was difficult to identify dengue because of the complexity of its symptoms, whereas for IDPs dengue symptomatology shared a blurry boundary with other infectious diseases. Therefore, it seems some participants were not able to distinguish dengue from diseases such as malaria and viral fevers endemic in the region. In regards to this finding, Srikiatkchachorn and Green (2010) stated that dengue is a disease characterized by a

broader range of clinical manifestations, and some Colombian authors (Pacheco-Coral and Martínez-Parra, 2013, Suárez et al., 2009, Pacheco-Coral, 2008, Suarez et al., 2005) have said that in endemic areas people match dengue symptoms with other infections such as cold, flu, malaria and other vector-borne diseases. Some other authors (Restrepo et al., 2014, Oliveira et al., 2014, Levett et al., 2000) have described that when people consult healthcare facilities for acute febrile syndrome, in dengue endemic areas with co-occurrence of other infections, either people may not think they had dengue, or healthcare workers could misdiagnose it. It should be noted that some authors (Horstick et al., 2012, Martínez et al., 2005) have agreed that the new dengue classification has reduced the latter problem. In regards of the co-occurrence of different infectious diseases and its effect in people's ability to self-diagnose dengue, other authors (García, 2007, Hausmann Muela et al., 2002, Fajardo et al., 2001, CAREY, 1971) have stated that in Colombia and other regions of the world people have their own diseases' classification which might not match the current western biomedical definition. Moreover, the regional history of diseases is important for people, and many of them continue using old denominations for emergent or re-emergent infections.

Additionally, in Colombia culturally people identified dengue as 'break bone fever' and some people consider that this type of dengue is not severe in comparison with haemorrhagic dengue[48] (Fajardo et al., 2001). In this research, only a small proportion of participants could list dengue symptoms related to severity like bleeding from nose and gum or abdominal pain. Both non-severe and severe dengue can cause minor bleedings, but a marker of severity is abdominal haemorrhages which produces abdominal pain to the ill person. Study respondents described typical manifestations of dengue that have also described by researchers in Colombia. For instance, Diaz *et al* (2006) followed a cohort of 251 people with dengue and fever syndrome, and they found that the early symptoms significantly associated with dengue, were bone ache, rhinorrhoea, diarrhoea, and rash. Same authors also described that bone ache was highly sensitive and rash was highly specific for dengue diagnosis (Martínez et al., 2005). Restrepo *et al* (2014) also studied 781

[48] Severe dengue

people but they did not find that any of the symptoms cited above were significantly related to dengue; however, they found clinical markers of severity in patients who did not consult for dengue. So, it is possible to assume that participants are well informed about dengue symptoms, but have insufficient knowledge about severe symptoms needing more urgent care. Finally, this may also contribute to people's perceptions that dengue is not a severe disease, for instance a study done in La Dorada, Colombia (Pacheco-Coral and Martínez-Parra, 2013) found that people did not consider dengue even a health problem, because they had not seen people with severe manifestations. Therefore, people mistakenly thought that not all the population were at risk of suffering dengue. Similar results were found by Suarez *et al* (2009) in two different endemic areas in Colombia, as well as the fact that people considered dengue as a relevant problem when their neighbours were sick. Likewise, respondents in this KAP survey had similar concerns about dengue severity and dengue as a problem in the community. Thus, it is possible that people conceived dengue as a mild disease and a problem for the community only. This misperception could influence their decision of seeking promptly medical aid when they feel sick.

The results from this research suggest that participants had some dengue knowledge which agreed with biomedical knowledge, but also that they had constructed their own definition of the disease, which is also stated by some Colombian authors (Suárez et al., 2009). In this extent, it is possible to hypothesize that people compound dengue definition, treatment, transmission, and prevention from their own and diverse biomedical knowledge. As Hausmaan Muela *et al* (2002) suggested it is possible that people who have lived in endemic areas, have been familiarized with the endemic disease, have been exposed to community participation interventions, and have had diverse options to treat the endemic disease, could make a synthesis of the biomedical knowledge and their own perception of the disease. Moreover, the authors (Hausmann Muela et al., 2002) stated that it is possible that people understand health information provided, but the interpretation of it could be different to the message that had been initially thought to convey to people. This research reflects how this synthesis of dengue biomedical knowledge was found among IDPs and non-displaced participants. Regarding people's knowledge of dengue treatment, only non-displaced people and some IDPs indigenous authorities referred a treatment for dengue. It

should be noted that IDPs indigenous authorities interviewed were long-term displaced people, and also had more health information because of their role within the community. These two facts could explain the similarities regarding knowledge of treatment in both groups of participants. On the one hand, it is possible that long-term Internal Displacement might have an influence in the possibility of sharing knowledge between IDPs and non-displaced populations. On the other hand, the leadership role might influence the type of knowledge that some IDPs, like indigenous authorities, could have in comparison to others IDPs. Another relevant finding is the fact that both populations stated that dengue could be treated with plants and traditional medicine, however only non-displaced populations considered those types of treatments restricted to rural areas.

The majority of the respondents knew that a mosquito transmits dengue and this finding has also been documented by other studies (Quintero et al., 2014, Arunachalam et al., 2012). In spite of this knowledge, it seems that people could not specify the type of mosquito either because they did not know it, or because they confused it with other insects. Qualitative data showed that people indeed have certain accurate knowledge of dengue vector, but they try to match this knowledge with their own empiric knowledge about mosquitoes. Similar results were found in a study done in Colombia in which people considered malaria vector was the same for dengue (Pacheco-Coral and Martínez-Parra, 2013). In the Americas the dengue and malaria vectors[49] eradication campaigns were made through the same programs and by the same health workers, reason that can explain why people might think that malaria and dengue have the same vector (Suarez et al., 2005, Hernández et al., 2002). In regards to people's knowledge about prevention, the majority of people correctly knew that mosquitoes can breed in stagnant water, but just a small proportion specified clean water. Moreover, qualitative data showed that some people were more concerned about the amount of stagnant water sources located in public spaces rather than household's potential breeding sites. Regarding to this, Caprara *et al* (2009), found in Brazil that some people pay more attention to avoid natural collections of water in the neighbourhood, in comparison with keeping their containers free of the vector.

[49] It should be noted that both *Anopheles* and *Aedes* could breed in stagnant water, but *Aedes aegypti* shifted to breed in clean water.

However, in this research participants acknowledged good practices within their households, as well as in the public space. So, probably participants were also worried about the role of the health authorities toward preventing vector breeding sites in the public space. Additionally, the KAP survey showed that IDPs preferred to treat the water rather than emptying water-filled containers as non-displaced considered. Nonetheless, non-displaced people tended not to empty their containers frequently in comparison with IDPs. In focus groups, IDPs indicated that water provided in their settlements was not potable and should be treated or boiled for preventing dengue, and this might explain why they gave this answer in the KAP survey. However, it seems that in some of the settlements were IDPs were located there were some problems of rivers' contamination (Muñoz-Londoño, 2014, Departamento Administrativo de Planeacion Municipal, 2008).

Lastly, it is necessary to say that people living in dengue endemic areas in Colombia have been exposed to several public health campaigns since the XIX century, and this might be the reason why they talked about dengue relating it to other fevers (Hernández et al., 2002). As was mentioned before in this section, these campaigns might have an impact in the collective memory of people at the moment of classifying current infectious diseases. According to the qualitative data, it seems that for people it was easier to denominate 'fevers' to the different infectious diseases in the areas where they lived. This custom could be rooted in the memory of the Colombians since 1859, when the first public health doctors started to investigate febrile infectious diseases in Colombia and classified them as 'fevers' (García, 2007). Furthermore, it is possible that participants considered as relevant to link the 'fevers' according to the place where they occur (urban versus rural areas), to the climate that may favour them, and to their virulence, findings which are similar to other results from studies done in Colombia (Pacheco-Coral and Martínez-Parra, 2013, Suarez et al., 2005).

Attitudes towards dengue

People's attitudes towards responsibilities of controlling dengue might be influenced by their own perceptions of individual actions as private, and communal actions as public. In

this respect the KAP survey revealed that participants considered themselves as responsible for controlling dengue. Some studies in Colombia (Pacheco-Coral and Martínez-Parra, 2013, Suárez et al., 2009, Suarez et al., 2005) have found that the individual space represented 'private life' for people, and health strategies are considered public activities which might not have an impact in the private space. However, qualitative data indicated that for participants was relevant not only the individual participation in public scenarios, but also the role of community and society in dengue prevention (as is promoted by IMS). Nevertheless, the KAP survey's results indicated that some respondents were informed about governmental activities for tackling dengue, but not all of them were involved in those activities. According to the qualitative data, people were not indifferent to the activities developed by the government, but they pointed as priorities for tackling dengue other areas neglected by the government. So, the lack of involvement of some participants with current governmental activities might be explained by the disagreements about priorities in the public agenda and priorities of communities for controlling dengue. Another possible explanation is the scarcity of opportunities for people to be engaged with governmental strategies. Both possibilities have been reported by other studies (Pacheco-Coral and Martínez-Parra, 2013, Espino et al., 2012, Mosquera et al., 2006, Suarez et al., 2005). Additionally, more than the half of participants said that a vector control technician had not visited them in their households. These results are consistent with findings from some studies done in Asia (Arunachalam et al., 2010) and Latin America (Quintero et al., 2014).

Moreover, the majority of the participants acknowledged to have received dengue vector control material anytime in their lives, and the type of material varied in both populations. Non-displaced people had predominately received ®Abate and IDPs had received educative flyers the most, and this discrepant results in the implementation of IMS components have also reported in studies done in Latin America. For instance, in Mexico among 2000 households surveyed, 72% of them were supplied larviciding whereas only 6.5% received health education. Those percentages in Colombia (1,994 households) were 24.9% and 21.4% respectively, and in Brazil (1,251 households) were 5% and 32.8% respectively (Quintero et al., 2014). Schmunis and Dias (2000) considered that the

difficulties in the implementation and sustainability of the IMS reflected the consequences of decentralization processes in Latin America. For the authors, the small role of the state as executor of activities, and the decrease in funds for allocating in the municipalities, led to a lack of trained staff and misuses of economic resources at the municipal level. The fact that non-displaced people received larviciding (®Abate) and IDPs educative flyers might reflect the differences in the IMS components which both types of populations have been exposed. In the case of non-displaced people, they have been impacted by the IMS mainly in Armenia, but IDPs have been targeted by IMS in different municipalities where they have lived permanently or temporally due to their migration pattern. These results may point out differences in the IMS implementation across Colombia, partly due to the consequences of decentralization processes as was explained in chapter four. In this respect, Periago y Guzman (2007) stated that the success of tackling dengue in the Americas relies not only on the prevention and control programmes developed by health authorities, but also on the multi-sector and community participation, and the articulation of those interventions with public policies.

Final words

This chapter illustrates how dengue is a complex phenomenon given that all the factors related to its transmission among populations. Although many efforts have been for tackling dengue, the control of its vector still represents a challenge as it has been exemplified in this chapter. Results from this chapter point out the importance of assessing the SDH of dengue at the biological level but also to examine them articulated with changes in social, environmental and global levels. In the next chapter, broader conclusions try to link the main findings described from chapter four onwards, and to outline general recommendations which might be useful not only in Colombia but in other regions of the world affected by dengue.

Chapter 8: Internal Displacement effects in Dengue in Colombia: conclusions and recommendations

In this chapter, the main findings from the document are summarised and then drawn together to discuss the final conclusions and implication of this research. Firstly, I will outline the relevance of studying Internal Displacement and dengue, and I will highlight key findings from this research. Then I move on to draw some conclusions from this study, and the broader implications of this work and the avenues for further research and recommendations on how it can be utilised.

Internal Displacement and dengue: what about the role of Social Determinants of Health (SDH) in this relationship?

In spite of the global efforts developed to tackle it (World Health Organization, 2012), dengue fever is still a threat for near half of the population worldwide. Around 3.9 billion people are at risk of having dengue in all the World Health Organization's (WHO) regions, and Colombia is the eight most endemic country in the world (World Health Organization, 2012, García-Betancourt et al., 2015). Dengue is a disease widely studied and researched, for which several policies in prevention and control have been created, which has developments in novelty solutions (such as the tetravalent vaccine) to prevent it, and which is considered a priority in a broad range of public health programmes. So, why is this disease still affecting so many people in the world? It is possible that this question has several answers, and one of those answers points out to the role of Social Determinants of Health (SDH) framework in the occurrence of this disease. As was hypothesized in this document (chapter one), SDH at different levels (global, social, environmental and individual) might influence the occurrence of the disease in endemic areas. In addition, as dengue is mainly an urban disease, the role of SDH in urban settings might lead to enhance its occurrence, especially when the SDH affect the three required factors (virus, vector, and human host) for dengue transmission.

In addition, urbanization processes are closely related to migration processes (voluntary or forced) which contribute to the way that urban areas are shaped, (Rydin et al., 2012) as it was previously mentioned (chapter two, section three). Migration is currently, one of the most relevant topics not only for nation-states, but also for the global community given the increasing amount of people who are moving within and across borders. In addition, conflict, environmental threats, religious persecution and developing programmes are considered drivers of forced migration worldwide. In this type of migration, it is important not only to consider the numbers of people involved, but also the challenges that this situation poses for generating the protective mechanisms for migrants in emergent situations. The latter topic is pivotal for public health programmes, because the movement of people has effects in the health of both migrants and host populations. Therefore, articulation of policies at the global, national, and local level is required in order to improve public health actions, and to reduce the impact of diseases in vulnerable populations such as migrants (especially forced ones). Furthermore, this articulation is relevant for dengue prevention and control programmes, because is in this type of scenario in which dengue is an opportunistic disease, given that its transmission is mainly in urban areas, and it is more likely to affect poor and vulnerable populations.

Bearing in mind that migration is a dynamic event, policies and public health programmes addressing dengue should be flexible to adapt to different settings across the world, and include in the equation the SDH. In regards of forced migration, the situation is more critical, when for example, current figures in forced migration shows that around 26 million people are IDPs, and almost 50% of that IDPs number corresponds to citizens of Syria and Colombia (United Nations High Commissioner for Refugees, 2015). These numbers indicated that IDPs are vulnerable migrants populations who need the aid not only from their countries of origin, but also from other countries, especially in the implementation of policies to provide them social protection in the short and long term to prevent the deterioration of their health and wellbeing. Therefore, the role of SDH should be also addressed and investigated for generating actions in emergent situations (such as forced migration) to prevent and control infectious diseases (such as dengue) which might affect vulnerable populations (such as IDPs).

Pertinence of this research's results for Internal Displacement and dengue

This research is one of few similar initiatives to investigate dengue in Colombia because it explores the role of migration processes in the occurrence of that disease. Some examples of studies done in related area are those studying migration and infectious diseases (Field et al., 2010, O'Brien et al., 2006, Antinori et al., 2004, Schwarz, 1996), migrants and dengue (Rabaa et al., 2013, Jelinek et al., 2002, Roberts and Kemp, 2001), and migrants and dengue in Colombia (Chaparro et al., 2014). This research also applies Social Determinants of Health (SDH) as a framework to explore migration's effect on dengue. Currently, there is a systematic review (Aagaard-Hansen and Chaignat, 2010) exploring the main SDH of Neglected Tropical Diseases (NTDs), and dengue was included, yet more specific research is needed in this area. Therefore, studying the relationship between Internal Displacement and dengue in the light of SDH represents an innovative area for Colombia and other endemic regions in the world that host large migrant populations.

When dengue is examined through the SDH framework it is possible to see how factors such as migration and urbanization, housing and physical environment, climate, and water management are affecting dengue occurrence and probably influence its transmission. Dengue is a disease that requires an integrated management, prevention, and control as the WHO (2012) states in its guidelines for tackling this disease. Multidisciplinary research is still need to understand the disease, as well as multi-sectorial participation to improve control (Periago and Guzmán, 2007). In this research, a mixed method was used, enabling a range of qualitative and quantitative methodologies to be applied and experts and approaches from a range of disciplines to be utilised. Also, the mixed method approach allowed the application of public engagement skills and work with communities affected by dengue and Internal Displacement, so the research itself involved the study subjects as active participants, as was described in chapter six. Moreover, these public engagement skills allowed me to reach IDPs in geographical areas where was safe to meet them. Also, it was possible to establish a dialogue with them not only about issues related to conflict, but

also related to the health problems that were affecting them. This is currently important in Colombia because is sought to have the health profiles of IDPs aiming to provide them adequate healthcare services. In addition, preliminary qualitative results were presented to local health authorities and IDPs-indigenous authorities in two meetings after fieldwork had finished, and they agreed that the information presented so far reflected their concerns, thoughts, and opinions. This was invaluable not least as obtaining feedback from participants about the research and findings is important in any public engagement, but it is also especially important to engage communities when tackling dengue; as well as working with relevant authorities, stakeholders, and broader communities in the application of strategies in endemic areas.

Although this study did not study conflict as a SDH of dengue, conflict as a cause of migration should be carefully considered, because conflict has effects on population health. Where violence is perpetuated for a long period of time, a State requires a great number of human and economic resources, for instance in Colombia the percentage of the Gross Domestic Product invested for conflict had reached ≅4% in 1998 (Borrero, 1998) and had not changed by 2014 (Bank, 2015b). When this type of economic investment is made in war instead of other areas such as education, social protection, and health, presumably the socio-economic disparities increase among populations, especially among people affected by conflict. In the case of dengue, it is hypothesized that war might lead to the existence of potential susceptible individuals due to the movement of people in and out of endemic regions, a situation which may enhance dengue virus transmission (Ooi and Gubler, 2010). If IDPs arrive at dengue endemic cities they are exposed not only to biological factors to (e.g., be at risk of acquiring the virus), but also to social factors (e.g., healthcare access barriers) which could increase their vulnerability to dengue and its complications. So, results from research are important to inform about the role of Internal Displacement in dengue occurrence in Colombia, when currently conflict seems to be decreased and peace agreements are trying to make reconciliatory efforts between illegal armed groups and the society. These efforts include, for instance, the restitution to IDPS their right to come back to their lands in rural areas. Therefore, it is important to continue the research in migration

and dengue, because if new of movement of people are produced (from urban to rural areas), it is possible that dengue virus strains circulate between urban and rural areas. The circulation of those strains in addition to the movement of vulnerable people might lead to an increase in dengue outbreaks in urban, peri-urban and rural areas.

What is possible to conclude from this research?

The results from chapter four reflect firstly, the international (World Health Organization, 2012) and national efforts in building a legal framework for tackling dengue. Secondly, how changes in public policies and a health system reform in Colombia, as well as the role of the state might have an impact on the articulation of those policies and dengue control programmes. However, Colombian policy changes during the 1990s were not isolated, but embedded in global processes such as decentralization of states as a response to global economic crisis (Pacheco-Coral and Martínez-Parra, 2013). The case study pointed out that if international guidelines are not articulated with the public policies implemented by each State, it is very difficult to reach international commitments of controlling diseases considered threats for public health. The articulation of policies does not remain restricted only to the social protection sector, but also to the economic, developmental, political, and educational. Also, the articulation of policies, funding and actions within countries is required for strengthening the healthcare systems, so that the goal of improving populations' health could be reached. It seems that, the disarticulation of policies affects the performance of certain programmes such as public health ones, and in the case of vector-borne disease programmes this situation might lead to a lack of sustainability. If the programmes' sustainability is not reached, it is possible to have failures in the prevention and control of these types of diseases. In the case of dengue, it is necessary to have sustainable programmes given the complexity of the disease transmission's pattern in urban settings, and the challenges for its prevention and control among communities. Sustainability of these programmes is crucial in dengue endemic countries where SDH related to poverty might lead transmission to worsen. Results from the case study

indicated that affected communities have explored their own ways to control dengue, as a response to the lack of sustainability of prevention and control programmes.

Results from the ecological analysis of dengue and Internal Displacement data, presented in chapter five, indicated they were correlated at the municipal level, although this association not was strong. These results suggest that demographical changes as a result of Internal Displacement are affecting the occurrence of dengue in urban areas of the municipalities. Although this type of analysis does not allow establishing causal relationships, it suggests that in urban settings the processes of forcible migration are related to the presentation of new dengue cases. Because this correlation is produced at the municipality level, both Internal Displacement and dengue should be considered as two phenomena affecting populations in those municipalities. Therefore, is not possible to apply these results to displaced individuals who have contracted dengue. It is also possible that other factors associated with the migration process and related to environmental changes might be contributing to the occurrence of dengue cases. Nevertheless, this correlation corroborates the hypothesis that the entrance of susceptible individuals to endemic areas affects dengue occurrence, leading to outbreaks and to more complicated outcomes of the disease including deaths. It is also plausible that other SDH derived of the migration process, and related to environmental changes might be contributing to the occurrence of dengue cases. For instance, a potential confounder of this correlation was the temperature, which is an important point to consider because temperature might be related to changes in the behaviour of people and in dengue vector's life cycle. Other SDH related to the built environment such as utilities network coverage (e.g., pipe water, and rubbish collection), as well as indicators of a good urban planning (e.g., neighbourhoods and public space design) might have also an effect on the occurrence of dengue cases at the municipal level.

In chapter six, the comparison of socio-demographic data of IDPs and non-displaced people, as well as the identification of barriers to reach healthcare services indicated that IDPs faced more disadvantages than non-displaced people in spite of living in similar neighbourhoods in the city of Armenia. This result indicated that socio-economic

disparities, due to conflict or processes of Internal Displacement (Ruíz-Ruíz, 2008), continue affecting IDPs even when they arrive in new places (Jacobsen, 2014, Ibáñez and Moya, 2010). In addition, when IDPs arrive to urban areas, those areas are usually not prepared to confront this emergent situation, therefore the response of healthcare providers and the provision of healthcare services to IDPs is scarce or does not exist (Leaning et al., 2011). In this context the barriers to healthcare services, that IDPs face, might have an indirect effect in the deterioration of their health status. This situation could have an impact on general health conditions of people living in host urban areas. For example, dengue occurrence might be different in host endemic areas, given that IDPs are more vulnerable to be sick and suffer severe illness. Nonetheless, this research found that IDPs were better organized as communities in comparison with non-displaced people, and this ability of networking allowed some of them to gain rights for having better health services. This situation might partly minimize the effects of not accessing rapidly the health care system to IDPs.

Chapter seven presents an exploration of perceptions about participants' relationship with water, as well as their behaviours towards water use and storage pointed out differences and similarities among IDPs and non-displaced populations. The differences were that IDPs emphasised that water was vital for living and covering needs, whereas non-displaced people emphasised that water as important for its use in housework activities. IDPs stored water for making use of it, whereas non-displaced people stored water aiming not to pay more for its use. In addition, socio-economic differences between both populations were reflected in the fact that non-displaced people had more containers, and tended more to fill them with water than IDPs. Additionally, similarities in the storage and use of water were found among participants, for instance both populations agreed that another reason for storing water was their lack of trust in the uninterrupted pipe water service. Apparently, this is a cultural custom among people living in areas whether pipe water service used to be suspended without notice (Suárez et al., 2009). Also, both populations were using water-filled containers with decorative purposes (e.g., flower vases), and this is important to consider because usually strategies for dengue control target other types of containers such as tanks. Yet, if water-filled containers with decorative purposes are going to be

targeted in dengue control strategies, it should be considered that people might decorate their households as a mechanism for coping with the lack of good neighbourhoods' conditions. For example, participants in this research lived in underprivileged neighbourhoods, many of which lacked aesthetic architectural design, areas for recreation and safety conditions. This situation was worst in informal neighbourhoods were IDPs were living; therefore it is not unusual that people want to have some decorative items to enhance and personalise the otherwise poor surroundings.

In spite of the fact that both populations store water, their perception of being at risk of dengue vector was different between both populations. Some non-displaced people considered that they were not exposed to dengue vector because it affected only poor people. As non-displaced people did not consider themselves as poor, they felt they were free of risk of having the dengue vector in their households. This is despite the fact that this research identified that both the household index and the Breteau index indicated higher levels of the vector in non-displaced households. This notion among non-displaced people might influence the practices they have towards infrequently emptying large water-filled containers. Infrequent emptying of these water-filled containers can allow them to act as breeding sites. Although these infested water-filled containers may not be the most productive sites for adult mosquitoes' emergence, they work as reservoirs for the vector. It is known that the eggs of the mosquito can survive desiccation for six months or more adhered to inner containers' walls, and if water wets these eggs they can continue their normal cycle up to adult mosquitoes (Centers for Disease Control and Prevention, 2014). Then, new generation of mosquitoes only need to find places where the conditions for emergence are more favourable and where there are available hosts for feeding on. It is relevant that the ratio of larvae to pupae in internally displaced households is lower than in non-displaced households indicating that larvae are more likely to progress to adult mosquitos capable of spreading dengue in IDP households. It is possible that mosquitoes found in IDPs households experience conditions such as higher temperatures that are more conducive to them continuing their life cycle. Inadequate housing conditions, high internal temperatures and poor practices towards certain type of containers such as flower vases might lead IDPs households to have infested containers, which produce efficiently dengue

vector as it was found in this research. Overcrowding may then mean that these vectors can infect more people than in less crowded households. Thus despite lower indexes of vector count, IDPs may be at greater risk of Dengue exposure than non IDPs because of an increased likelihood that vectors will progress to mature forms and higher population density. Other factors, such as climate changes in the city of Armenia and potential breeding sites in the public space should be also taken into account.

In both populations there was a reasonable level of knowledge about dengue which might indicate that both populations have been impacted by dengue prevention and control programmes. As was mentioned before in chapter one and seven, it is possible that people's knowledge might differ from but is based on the medical knowledge imparted by public health workers. In addition, the role of social networking among IDPs was central to communicate dengue knowledge and promote its prevention and control. Yet, participants had poorer levels of knowledge about the symptoms of severe dengue that may need urgent medical attention. Regarding participant's perceptions about governmental actions, IDPs were more likely to recognise the need for governmental intervention for dengue prevention and control. IDPs households in Armenia seemed to be more impacted by governmental actions; however those households had more production of pupae forms in water-filled containers (which is related to a greater risk of dengue transmission). It is possible that lacks of sustainability in the IMS in Armenia would have led non-displaced households to have more larvae forms of dengue vector; however, this research did not measure the impact of IMS strategy in the city.

What this research considered pertinent as recommendation for policy makers and further research

Alongside with main conclusion from chapters, recommendations for policies and further research will be outlined. This research found that dengue and migration policies are not still interconnected, so it is necessary that regulations in both areas address the topic of migrant's health, with emphasis in diseases like dengue which might be influenced by the movement of people. In addition, international efforts, such as the one led by The Special

Programme for Research and Training in Tropical Diseases (TDR-WHO), are crucial when considering to apply the SDH framework an other approaches for tackling Neglected Tropical Diseases (dengue included) in affected countries. This type of efforts required multidisciplinary and multi-sectorial work, which is relevant for impacting on SDH of NTDs. Currently, Colombia, is making efforts toward the inclusion of the SDH framework into the public health programmes (Ministerio de Salud y Protección Social, 2013), and it is expected that these programmes respond to health needs of the general population and also of the vulnerable populations. However, these efforts in public health should also be considered in the development of policies in migration, because mobilization of people might lead certain diseases (such as dengue) to affect migrants and hosts populations. This research found an ecological not strong association between levels of dengue and levels of Internal Displacement. Given the plausibility of an association and the size of the IDPs in Colombia, it is recommended that further research be conducted to explore that association. In this extent, it is also recommended to apply multilevel modelling, multivariate modelling, or mathematical modelling which allow assessing the weight of other determinants in the association. In special it is necessary to explore the role of environmental determinants in the relationship between dengue and IDPs.

In addition, this research undertook fieldwork in one dengue endemic area with a high level of Internal Displacement; yet further work in other geographical areas is needed to understand if the results are generalizable to other IDPs. It is also required to assess how non-endemic areas reporting dengue, could improve their public health systems to diagnose and treat adequately it. Additionally, this research confirmed poorer socio economic status, low income, and less access to education and healthcare in IDPs compared to the host population. National policies and local actions are needed to address these underlying inequalities, but is also needed more research in IDPs and inequalities to inform public health actions. Nevertheless, these efforts should be part of international responses as it was stated before.

There is also a need to ensure that both populations are well informed about the symptoms of severe dengue and have access to emergency health services should these occur. This

research found, however that in some respects IDPs had better knowledge and understanding of dengue transmission and were more likely to frequently empty containers than non-displaced households. The findings that non-displaced households did not feel at risk of having dengue vector in the household, that they infrequently emptied water-filled tanks, and that most of their households' exposure to dengue vector came from these water-filled tanks indicates the need for increased education about the need to empty these tanks. In this respect, it is necessary that dengue prevention and control programmes could have enough resources to implement strategies with communities, maintain their sustainability, and to evaluate them.

In IDPs households there were generally fewer containers and consequently entomological indexes occurrence were lower than in non- displaced households. Despite emptying containers more frequently than non-displaced households the ratio of larvae to pupae was lower indicating that conditions within IDP households are more conducive to the vector completing its lifecycle. This was particularly important for flower vases where the majority of both larvae and pupae were found. There is a need for targeted interventions to highlight this risk to IDPs, and to investigate whether more frequent emptying of vases can adequately mitigate this risk. For these types of interventions, the role of community participation and public engagement strategies is crucial, in order to work alongside with community members, in the promotion of good practices. In this research, women played a key role in dengue control within the household (cleaning activities), and this might indicate that the women's role is related to dengue control as other authors have found (Galvan and Gutierrez, 2004, Kusriastuti et al., 2004). Also, in this study, the role of men leading preventive active towards dengue was partly assessed in focus groups. However, given that in this research surveyed more women than men, it is recommended that future research projects explore in depth the role of women and men in dengue prevention and control.

In addition, public engagement might facilitate to assess the opinions and attitudes of people towards public health actions to control dengue. There is also a need to investigate whether factors such as internal household temperature in IDPs households encourage

vector emergence and whether simple modifications such as improved ventilation could reduce this effect, or whether is necessary modifications in housing designs.

Finally due to resource constraints this study was not able to make a direct comparison of the risk of Dengue infection in displaced and non-displaced households. Such work would require large scale serological surveys to identify previous infection and/or prospective cohort studies with regular follow up to identify cases of active disease. This point might be also important for the vaccine introduction, in endemic and middle-income countries, (such as Colombia) in which vulnerable populations (such as IDPs) should be prioritized for being vaccinated due to their vulnerability. This research demonstrates the need for further research to understand this problem and the feasibility of working with IDPs and non displaced populations to undertake such research in future. Finally, it is necessary that this type of research be more impacted by funding agencies because, as it was mentioned before, it requires enough economic resources to assess several determinants influencing the relationship dengue and IDPs.

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Appendices

Appendix 1 Search strategy for the literature review presented in chapter 1

First, I searched publications from the World Health Organization and Pan-American Health Organization and identified key authors in the areas of COMBI, IEC, and community participation. Second, I searched relevant papers in Google, Google Scholar, LILACS, list of publications from New England Journal of Medicine, Emerging Infectious Diseases, and Pan American Journal of Public Health. Third, I applied snowballing literature review (Greenhalgh and Peacock, 2005) and I reviewed the references lists of the full papers previously found (method known as reference tracking. Finally, I searched in different databases (LILACS-BIREME, PUB-MED, AMED, OVID-MEDLINE, EMBASE, SOCIAL POLICY AND PRACTICE and GLOBAL HEALTH ARCHIVE) the following MeSH terms:

- Mixed AND design AND ("dengue/Aedes" OR "dengue/Aedes")
- Multi AND ("methods" OR "methods" OR "method") AND ("dengue/Aedes" OR "dengue/Aedes")
- Qualitative AND quantitative AND ("dengue/Aedes" OR "dengue/Aedes")

Searched terms were selected according to Creswell and Plano-Clark (2007); the review was restricted to the period 1979-2015, and included abstracts in English, Spanish and Portuguese. Moreover, I applied the criteria suggested by O'Cathain et al. (2007) for selecting and excluding papers; also, I undertook this review from October 2011 until January 2015.

Appendix 2 Different dengue studies that I reviewed for gathering evidence of mixed methods designs and dengue-Chapter 1

	Title	Year	Country	Authors	Study's topic	Collection data mixed method	Reasons for using mixed methods	How the author mix	Design for mixed method study
1	Social sustainability of Mesocyclops biological control for dengue in South Vietnam	2015	Vietnam	Tran TT, Olsen A, Viennet E & Sleigh A.	Vector control	Entomological survey, semi-structured interviews, focus groups, field-notes and participant observation"	Exploration	Mixing in the results	Concurrent
2	Entomological impact and social participation in dengue control: a cluster randomized trial in Fortaleza, Brazil	2015	Brazil	Caprara A, De Oliveira Lima JW, Rocha Peixoto AC, Vasconcelos Motta CM, Soares Nobre JM, Sommerfeld J & Kroeger A.	Eco systemic approach of dengue	Intervention, public engagement, key informant interviews and participant observations	Complementarity	In data collection only -Mixing in the results	Embedded (qualitative in a field trial)
3	Improved dengue fever prevention through innovative intervention methods in the city of Salto,	2015	Uruguay	Basso C, García da Rosa E, Romero S, González C, Lairihoy R, Roche I, Caffera RM, da Rosa R,	Community participation	Intervention, public engagement	Confirmatory	In data collection only	Embedded (qualitative in a cluster randomized trial)

	Uruguay			Calfani M, Alfonso-Sierra E, Petzold M, Kroeger A, Sommerfeld J					
4	Acceptability of impregnated school uniforms for dengue control in Thailand: a mixed methods approach	2014	Thailand	Murray N, Jansarijik S, Olanratmane P, Maskhao P, Souares A, Wilder-Smith A *et al*	Vector control	Self-questionnaires, focus groups, semi-structured interviews	Confirmatory	Mixing in the results	Embedded (Quantitative and qualitative in a RCT)
5	Community-based participatory research for prevention of dengue fever from the approach to health communication: the experience in the Caribbean slope of Costa Rica (abstract)	2014	Costa Rica	Marroquin L, Avendano-Lopez A, Murcia C, Martinez Y, Vargas E, Murillo G *et al*	Community participation	Focus groups and ethnomethodology. KAP	Not indicated	Mixing in the results	Not indicated

6	Designing a Community Engagement Framework for a New Dengue Control Method: A Case Study from Central Vietnam	2014	Vietnam	McNaughton D & Duong TT	Community participation	"Anthropological methodology mixing both approaches. Triangulating results"	Exploratory	Mixing in the results	Sequential
7	Use and acceptance of long lasting insecticidal net screens for dengue prevention in Acapulco, Guerrero, Mexico	2014	Mexico	Jones C, Benitez-Valladares D, Guillermo-May G, Dzul-Manzanilla F, Che-Mendoza A, Barrera-Perez M *et al*	Vector control	Multiple-choice survey and focus groups, semi-structured interviews, one-on-one interviews	Comparability	Integration in the analysis-Mixing in the results	Sequential explanatory
8	Assessment of gender distribution in dengue surveillance data, the Lao People's Democratic Republic	2013	Lao People's Democratic Republic	Prasith N, Keosavanh O, Phengxay M, Stone S, Lewis H, Tsuyuoka R *et al*	Epidemiology of dengue	Dengue surveillance data. Unstructured informal interviews	Confirmatory	Mixing in the results	Sequential explanatory

9	Evaluation of Communication for Behavioral Impact (COMBI) Program in Dengue Prevention: A Qualitative and Quantitative Study in Selangor, Malaysia	2013	Malaysia	Azmawati M, Aniza I & Ali M	Community participation	Focus groups and KAP	Not indicated	Mixing in the results	Sequential explanatory
10	Risk factors related to dengue infections in primary school students: Exploring students' basic knowledge of dengue and examining the larval indices in southern Thailand	2013	Thailand	Suwanbamrung C, Promsupa S, Doungsin T & Tongjan S	Community participation	"Cross-sectional quantitative and qualitative approach"	Not indicated	Mixing in the results	Sequential exploratory

11	Cooperation between health personnel and schools for the identification and control of dengue	2013	Brazil	Silva PC, Martins AM, Schall VT	Community participation	KAP, Checklist for vector breeding sites, intervention, semi-structured interviews	Complementarity	Mixing in the results	Embedded
12	Experiences gained in the phases of management and sustainability of dengue epidemics	2013	Cuba	Leon-Cabrera P, Farina-Reinoso A, Goslin-Collymore L, Sanchez-Vidal G, Sanchez-Santos L & Rodriguez-Bouza E	Vector control	Seroepidemiology, KAP, one-to-one interview	Complementarity	Mixing in the results Quantitazing qualitative data	Concurrent
13	Evaluation of completeness of dengue records: exploratory study of compulsory notices.	2012	Brazil	Barreto PA, Braga ALS, Andrade M	Epidemiology of dengue	Documental review, quantitazing qualitative data, triangulating data with health workers	Exploratory	In data collection only	Sequential exploratory

14	Community-centered eco-bio-social approach to control dengue vectors: an intervention study from Myanmar	2012	Myanmar	Wai KT, Htun PT, Oo T, Myint H, Lin Z, Kroeger A, Sommerfeld J & Petzold M	Eco systemic approach of dengue	KAP, focus groups, in-depth interviews, intervention	Complementarity	Quantitiazing qualitative data. Mixing in the results	Embedded
15	Testing the Effectiveness of Community-Based Dengue Vector Control Interventions Using Semi parametric Mixed Models	2012	Cuba	Sanchez L, Maringwa J, Shkedy Z, Castro M, Carbonell N & Van der Stuyft P	Community participation	Surveillance, community working groups	Complementarity	In data collection only	Sequential exploratory
16	Genetically modified mosquito: The Malaysian public engagement experience	2012	Malaysia	Subramaniam TS1, Lee HL, Ahmad NW, Murad S.	Vector control	Discussion groups, public engagement	Complementarity	In data collection only	Sequential exploratory

17	Community mobilization and household level waste management for dengue vector control in Gampaha district of Sri Lanka; an intervention study	2012	Sri Lanka	Abeyewickreme W, Wickremasinghe A. R, Karunatilake K, Sommerfeld J & Kroeger A	Eco systemic approach of dengue	Intervention, survey, focus group discussions, key informant interviews and views of heads of households	Confirmatory	Collecting data-Mixing in the results	Sequential explanatory
18	Community-based control of Aedes aegypti by adoption of eco-health methods in Chennai City, India	2012	India	Arunachalam N, Tyagi BK, Samuel M, Krishnamoorthi R, Manavalan R, Tewari SC, Ashokkumar V, Kroeger A, Sommerfeld J & Petzold M	Eco systemic approach of dengue	Public engagement, intervention, survey, focus group discussions, key informant interviews and views of heads of households	Confirmatory	Collecting data-Mixing in the results	Sequential explanatory
19	Building and analyzing an innovative community-centered dengue-ecosystem management	2012	Indonesia	Tana S, Umniyati S, Petzold M, Kroeger A & Sommerfeld J	Eco systemic approach of dengue	Documental review, public engagement, focus groups, interviews	Confirmatory	Collecting data-Mixing in the results	Sequential explanatory

	intervention in Yogyakarta, Indonesia								
20	A community empowerment strategy embedded in a routine dengue vector control programme: a cluster randomised controlled trial	2012	Cuba	Castro M, Sánchez L, Pérez D, Carbonell N, Lefèvre P, Vanlerberghe V & Van der Stuyft P.	Community participation	Intervention, public engagement, survey	Confirmatory	In data collection only	Sequential explanatory
21	Usefulness and applicability of the revised dengue case classification by disease: multicentre study in 18 countries	2011	Multi-country	Barniol J, Gaczkowski, Vega-Barbato E, da Cunha R, Salgado D, Martinez D *et al*	Dengue classification	Intervention, interviews, medical charts review, self-questionnaire, focus groups	Comparability	Integration in the analysis-Mixing in the results	Sequential exploratory
22	Ecological Links Between Water	2010	Colombia	Padmanabha H, Soto E, Mosquera M, Lord C.C &	Eco systemic approach of dengue	Survey, ethnographic narrative	Confirmatory	In data collection only	Embedded (qualitative in a cross sectional)

	Storage Behaviors and Aedes aegypti Production: Implications for Dengue Vector Control in Variable Climates			Lounibos L.P					
23	An ecosystem perspective in the socio-cultural evaluation of dengue in two Colombian towns	2009	Colombia	Suarez R, Gonzalez C, Carrasquilla G & Quintero J	Eco systemic approach of dengue	A cross-sectional study within eco systemic methodology. Qualitative and quantitative approaches	Exploratory	In data collection only	Concurrent
24	An ecosystemic approach to evaluating ecological, socioeconomic and group dynamics affecting the prevalence of Aedes aegypti in two	2009	Colombia	Quintero J, Carrasquilla G, Suarez R, Gonzalez C & Olano V	Eco systemic approach of dengue	A cross-sectional study within eco systemic methodology. Qualitative and quantitative approaches	Exploratory	In data collection only	Concurrent

	Colombian towns								
25	Knowledge and practice on prevention and control of *Aedes aegypti* in a risk zone	2009	Cuba	Hernandez-Quinones S, Noriega-Bravo V, Echemendia-Cursi B & Ponce-Cardenas F	Epidemiology of dengue	KAP, focus groups, participant observation	Complementarity	In data collection only	Sequential explanatory
26	Irregular water supply, household usage and dengue: a bio-social study in the Brazilian Northeast	2009	Brazil	Caprara A, Lima JW, Marinho AC, Calvasina PG, Landim LP & Sommerfeld J.	Eco systemic approach of dengue	"Anthropological perspective, based mostly on qualitative methods, complemented by a household study of the vector's ecology, utilizing a quantitative approach"	Explanatory	Collecting data-Mixing in the results	Embedded (quantitative in an anthropological study)

27	Community involvement in dengue vector control: cluster randomized trial	2009	Cuba	Vanlerberghe V, Toledo ME, Rodríguez M, Gomez D, Baly A, Benitez JR & Van der Stuyft P	Community participation	Intervention, group discussions, public engagement	Confirmatory	In data collection only	Embedded (qualitative in a cluster randomized trial)
28	Evaluation of a syndromic surveillance for the early detection of outbreaks among military personnel in a tropical country	2008	French Guyana	Jefferson H, Dupuy B, Chaudet H, Texier G, Green A, Barnish G, Boutin Jean-Paul & Meynard Jean-Baptiste	Epidemiology of dengue	"Two groups of system stakeholders, for data input and data analysis, were interviewed using semi-structured questionnaires to assess timeliness, data quality, acceptability, usefulness, stability, portability and flexibility of the system"	Confirmatory	Mixing in the results	Sequential

29	Achieving sustainability of community-based dengue control in Santiago de Cuba	2007	Cuba	Toledo-Romani M,Vanlerberghe V, Perez D, Lefevre P, Ceballos-Ursula E, Bandera D, Baly-Gil A, & Van der Stufyt P	Community participation	Direct observation, questionnaire, review of documents, key informant interviews and in-depth group interviews	Confirmatory	Integration in the analysis-Mixing in the results	Triangulation
30	Community participation in dengue prevention: an approach from the perspective of different social actors	2006	Cuba	Toledo-Romani M, Baly-Gil A, Ceballos-Ursula E, Boelaert M & Van der Stufyt P	Community participation	Focus groups, discussion groups, semi-structured interviews, questionnaires	Exploratory	In data collection only	Concurrent
31	Comunicación, movilización y participación: lecciones aprendidas en la prevención y control de la fiebre dengue (fd)	2006	Colombia	Mosquera M, Obregón R, Lloyd L, Orozco M & Pena A	Community participation	Intervention, semi-structured interviews, focus groups, survey, public engagement	Comparability	Collecting data-Mixing in the results	Embedded (Quantitative and qualitative in a field trial)

32	Intersectoral coordination in Aedes aegypti control. A pilot project in Havana City, Cuba	2005	Cuba	Sanchez L, Perez D, Perez T, Sosa T, Cruz G, Kouri G, Boelaert M & Van der Stufyt P	Community participation	Intervention, interviews, KAP	Complementarity and exploratory	In data collection only	Embedded (qualitative in a quasi-experimental study)
33	Participación comunitaria en el control de Aedes aegypti: opiniones de la población en un municipio de La Habana, Cuba	2004	Cuba	Sanchez L, Perez D, Cruz G, Silva L. Boelaert M & Van der Stuyft P	Community participation	Open interviews-survey (Linkert scale)	Exploratory	In data collection only	Sequential exploratory
34	Social Mobilization Using Strategies of Education and Communication to Prevent Dengue Fever in Bucaramanga, Colombia	2004	Colombia	Luna J, Chain I, Hernandez J, Clark G, Bueno A, Escalante R *et al*	Community participation	Formative research, and data analysis based on the Stages of Change Mode	Exploratory	In data collection only	Sequential

35	Students' Perceptions about Mosquito Larval Control in a Dengue-Endemic Philippine City	2004	Philippines	Lennon J	Community participation	Semi-structured, open-ended question format	Not indicated	Quantitiazing qualitative data.	Sequential
36	Community-based Assessment of Dengue-related Knowledge among Caregivers	2004	Myanmar	Win KT, Nang SZ & Min, A	Community participation	Survey, personal interviews, focus group discussions and observational checklist.	Complementarity	Quantitiazing qualitative data. Mixing in the results	Sequential exploratory
37	Dengue vector control and community participation in Catanduva, São Paulo State, Brazil	2003	Brazil	Chiavarallotti-Neto F, Fiorin A, Conversani D, Cesarino M, Barbosa A, Dibo M *et al*	Community participation	Survey, semi-structured interviews, validating data with community, public engagement	Complementarity	Integration in the analysis-Mixing in the results	Sequential exploratory
38	Community-based dengue prevention programs in Puerto Rico:	2002	Puerto Rico	Winch P, Leontsini E, Rigau-Perez J, Ruiz-Perez M, Clark G & Gubler D	Community participation	Semi-structured interviews, focus groups, survey	Complementarity	Mixing in the results	Sequential exploratory

	impact on knowledge, behavior, and residential mosquito infestation								
39	Evaluation of an educational Program on Dengue and Aedes aegypti targeting elementary school children	1995	Honduras	Soto-Hernandez J, Fernandez-Cerna E & Avila-Montes G	Community participation	KAP, focus groups, in-depth interviews, and observation”	Exploratory	In data collection only	Sequential exploratory

Department of Infection and Population Health
University College London,

This study has been approved by the UCL Research Ethics Committee 4784/001

THE ROLE OF MIGRATION PROCESSES IN DENGUE FEVER DETERMINANTS: A CROSS DISCIPLINARY APPROACH
Community locals
Participant Information Sheet

Research team:

Telephone:

Email:

Dear Sir/Madam

We would like to invite you to participate in the following study about a disease called dengue, contributing your own knowledge.

What is dengue?

Dengue is a disease which produces fever and some discomfort similar to a cold and in some cases can cause haemorrhage. It can be contracted through mosquito bites. In this city, especially during the rainy seasons, the temperature and the humidity are linked to the existence of mosquitoes and the spreading of dengue.

But also in this city the health authorities and the local government have been working to preventing dengue and control mosquitoes. You might have heard or seen the campaigns about how keep your house and city free of mosquitoes?

As we did not design those campaigns we would like to interview you to get your opinion them and also your knowledge regarding dengue and mosquitoes.

Do I have to participate?

You should only participate if you wish to; while we would encourage participation, we do emphasize that not choosing to take part will not disadvantage you or your health status. Also you can decide to participate and then change your mind later and decide not to. Before you decide whether you want to take part, it is important you read the following information carefully and discuss with others if you wish.

Please contact one of the research team if there is anything that isn't clear or you would like more information.

What is this study about?

We are running a study, which aims to understand people's views and thoughts regarding dengue, and also to know what people do to protect themselves against mosquitoes.

This project is divided in the following phases:

1) Phase one: we are interested in meeting with communities to find out about peoples´ dengue fever knowledge. So we would like to invite you and others members of your community to a meeting for hearing about your knowledge and understanding about dengue fever and mosquitoes.

The meeting will be audio recorded; however, when we do the transcriptions (written up) of the meeting, we will use pseudonyms (false name) instead of any names to protecting people's anonymity. We will destroy the original audio files once they are transcribed. Everything that is discussed at the meeting is confidential and anonymous, but we will ask for your consent to participate. The signed consent will be held in the archives at University College London for a two-year period.
The meeting will take about one and half hours maximum and you will receive £10 gift as a thank you for your time.

2) Phase two: We will gather together all the information from the first meeting, and hold a second meeting to give feedback to you and other participants and to hear your ideas for keeping people free from dengue. Also we are going to share with you how we are planning to develop the third phase of this project and we would like to know your ideas and opinions about it.

We hope you will also be willing to participate in this meeting. In order to do so, we will ask you again for your consent and as before we will audio-record the meeting. We will follow the same process as in the first phase for keeping your confidentiality.

We expected to share the main issues you and other people address, with local health authorities in order they can improve the prevention and control actions against dengue; so we would like to have your permission for sharing this anonymized information with them.

Please remember that you do not have to take part in this study or consent to us holding your details in our archives. Participation is entirely voluntary. Whether you choose to not participate in this study, or to participate but later on decide not to continue even though the study may not have finished, you are free to do so and this will not be in any way disadvantageous for you or your health status. Also during the course of this study the researchers might decide not to include you in the study, and this does not have any repercussion for you or your health status.

So, what are the risk and benefits for you whether you decide to take part of the study? Please read the following paragraphs.

What are the risks for me or my health?

Phase 1 and 2 of this study do not represent any risk for you or your health. Each meeting will demand a maximum 2 hours of your time and we are not going to ask you any personal information. Also people from the research team will be at the meetings; in the case you feel uncomfortable with the presence of anyone from the research team you can let us know and he will leave the meeting.

What are the benefits for me or my health?

The indirect benefit for you and your community from the participation on the meetings will be the possibility to address the problem of dengue and mosquitoes and to try identifying possible solutions for this problem in the community.

If you have any questions about taking part in this study, please do not hesitate to contact a member of our research team. We can be contacted on telephone: xxxxx or email: xxxxx

Thank you for taking the time to read about this study.

Yours sincerely, The XXX research team

Department of

Infection and Population Health
University College London,

This study has been approved by the UCL Research Ethics Committee 4784/001

THE ROLE OF MIGRATION PROCESSES IN DENGUE FEVER DETERMINANTS: A CROSS DISCIPLINARY APPROACH

Community members-migrants Participant Information Sheet

Research team:

Telephone:

Email:

Dear Sir/Madam

We would like to invite you to participate in the following study about a disease called dengue, contributing your own knowledge.

What is dengue?

Dengue is a disease, which produces fever, and some discomfort similar to a cold and in some cases can cause haemorrhage. It can be contracted through mosquito bites. In this city, especially during the rainy seasons, the temperature and the humidity are linked to the existence of mosquitoes and the spreading of dengue.

But also in this city the health authorities and the local government have been working to preventing dengue and control mosquitoes. You might have heard or seen the campaigns about how keep your house and city free of mosquitoes?

As we did not design those campaigns we would like to interview you to get your opinion them and also your knowledge regarding dengue and mosquitoes.

Do I have to participate?

You should only participate if you wish to; while we would encourage participation, we do emphasize that not choosing to take part will not disadvantage you or your health status. Also you can decide to participate and then change your mind later and decide not to. Before you decide whether you want to take part, it is important you read the following information carefully and discuss with others if you wish.

Please contact one of the research team if there is anything that isn't clear or you would like more information.

What is this study about?

We are running a study, which aims to understand people's views and thoughts regarding dengue fever and also to know what people do to protect themselves against mosquitoes.

This project is divided in the following phases:

1) Phase one: we are interested in meeting with communities to find out about knowledge of fevers that affect health. So we would like to invite you and others members of your community, who share with you the characteristic of being migrant, to a meeting for hearing about your knowledge and understanding about fevers and mosquitoes. In special we will ask you about your personal experience about fever and mosquitoes in the places you lived before settling in this city.

The meeting will be audio recorded; however, when we do the transcriptions (written up) of the meeting, we will use pseudonyms (false name) instead of any names to protecting people's anonymity. Everything that is discussed at the meeting is confidential and anonymous, but we will ask for your consent to participate. The signed consent will be held in the archives at University College London for a two-year period.
The meeting will take about one and half hours maximum and you will receive £10 gift as a thank you for your time.

2) Phase two: We will gather together all the information from the first meeting, and hold a second meeting to give feedback to you and other participants and to hear your ideas for keeping people free from dengue. Also we are going to share with you how we are planning to develop the third phase of this project and we would like to know your ideas and opinions about it.

We hope you will also be willing to participate in this meeting. In order to do so, we will ask you again for your consent and as before we will audio-record the meeting. We will follow the same process as in the first phase for keeping your confidentiality.
We expected to share the main issues you and other people address, with local health authorities in order they can improve the prevention and control actions against dengue; so we would like to have your permission for sharing this anonymized information with them.

Please remember that you do not have to take part in this study or consent to us holding your details in our archives. Participation is entirely voluntary. Whether you choose to not participate in this study, or to participate but later on decide not to continue even though the study may not have finished, you are free to do so and this will not be in any way disadvantageous for you or your health status. Also during the course of this study the researchers might decide not to include you in the study, and this does not have any repercussion for you or your health status.

So, what are the risk and benefits for you whether you decide to take part of the study? Please read the following paragraphs.

What are the risks for me or my health?

Phase 1 and 2 of this study do not represent any risk for you or your health. Each meeting will demand a maximum 2 hours of your time and we are not going to ask you any personal information. Also people from the research team will be at the meetings; in the case you

feel uncomfortable with the presence of anyone from the research team you can let us know and he will leave the meeting.

What are the benefits for me or my health?

The indirect benefit for you and your community from the participation on the meetings will be the possibility to address the problem of dengue and mosquitoes and to try identifying possible solutions for avoiding dengue in the community.

If you have any questions about taking part in this study, please do not hesitate to contact a member of our research team. We can be contacted on telephone: xxxxx or email: xxxxx

Thank you for taking the time to read about this study.

Yours sincerely, The XXX research team

UCL

Department of

Infection and Population Health
University College London,

This study has been approved by the UCL Research Ethics Committee 4784/001

THE ROLE OF MIGRATION PROCESSES IN DENGUE FEVER DETERMINANTS: A CROSS DISCIPLINARY APPROACH

Survey and blood donation -Participant Information Sheet

Research team:

Telephone:

Email:

Dear Sir/Madam

We would like to invite you to participate in the following study about a disease called dengue, contributing your own knowledge.

What is dengue?

Dengue is a disease, which produces fever, and some discomfort similar to a cold and in some cases can cause haemorrhage. It can be contracted through mosquito bites. In this city, especially during the rainy seasons, the temperature and the humidity are linked to the existence of mosquitoes and the spreading of dengue.

But also in this city the health authorities and the local government have been working to preventing dengue and control mosquitoes. You might have heard or seen the campaigns about how keep your house and city free of mosquitoes?

As we did not design those campaigns we would like to interview you to get your opinion them and also your knowledge regarding dengue and mosquitoes.

Do I have to participate?

You should only participate if you wish to; while we would encourage participation, we do emphasize that not choosing to take part will not disadvantage you or your health status. Also you can decide to participate and then change your mind later and decide not to. Before you decide whether you want to take part, it is important you read the following information carefully and discuss with others if you wish.

Please contact one of the research team if there is anything that isn't clear or you would like more information.

What is this study about?

We are running a study, which aims to understand people's views and thoughts regarding dengue fever and also to know what people do to protect themselves against mosquitoes. We have already met some of your neighbours and we discuss with them about dengue fever and mosquitoes.

Now, we are going to visit some houses in your neighbourhood and administer a short survey to ask more people their views about dengue, mosquitoes, water use and certain physical characteristics of their household. So, we would like to enter the houses and check some construction details if people agree with that. Might be possible we would like to take photos of the kitchen and toilet walls and floor, and of the water tanks; so we will ask people for permission of taking photos of those areas. Two researchers will administer the questionnaire and it is totally anonymous.

Also we would like to check whether there are mosquito eggs in the main water tank has used for cleaning purposes; in case we find it we would like to take some samples of the water for confirming whether those eggs are from the mosquito which spreads dengue. In a second visit we will let you know about these results and we are going to explain you how to keep free of those eggs in the water tank.

We are also interested in knowing whether people have been sick because of dengue. So we will ask adults if we can take a small blood sample from their finger to find out if they have been ill because of dengue. We will only use the age and sex of the person donating their blood sample. The sample will be sent to a laboratory using a number and without any personal information. The results from those tests will be shared in a private session with each person who has donated blood explaining them the gotten result.

For this part of the study, we will only ask participants for personal information such as age, gender and ethnicity. We are going to collect and store that information according to the Colombian Data Protection Guidelines and the Data Protection Act (1998). We are not going to pass on that information to anyone without your prior written consent.

Please note that we are going to randomly select the houses visited and the people selected to participate in our survey. If you decide to participate, you will sign a consent format for this process. Everything that is filled in the questionnaire is confidential and anonymous. The signed consent and the questionnaire will be held in the archives at University College London for a two-year period.

Please remember that you do not have to take part in this study or consent to us holding your details in our archives. Participation is entirely voluntary. Whether you choose to not participate in this study, or to participate but later on decide not to continue even though the study may not have finished, you are free to do so and this will not be in any way disadvantageous for you or your health status. Also during the course of this study the researchers might decide not to include you in the study, and this does not have any repercussion for you or your health status.

So, what are the risk and benefits for you whether you decide to take part of the study? Please read the following paragraphs.

What are the risks for me or my health?

This last phase of the study represents a low-risk research for human beings according to the Colombian Health Ministry Enact 008430 year 1993, and UCL Research Ethics Committee Guidelines. The blood sample may lead to mild discomfort but is a safe procedure. All blood samples will be taken by fully trained staff.

What are the benefits for me or my health?

Whether you decide for participating in the survey you have an indirect benefit that is collaborating with researchers for having a better knowledge of dengue and discovering ways for preventing and controlling it, which at the end represents a benefit for keeping a healthy community in this city.

Whether you decide for donating blood the benefit for you will be to know if you have suffered or not dengue. You will be offered a counselling session in the moment of getting the results of the blood test. It is important you to know that in the case your results will be positive for dengue this not necessarily mean that you have a current dengue episode but might indicate you have had a previous dengue infection. Whether you have a positive or negative test we can explain to you what does mean, solve your questions and advice you for not getting dengue or severe illness.

Whether you allow us to take samples from the water tank, later on we can confirm you whether or not the mosquito put some eggs into the water and we can explain to you how you can keep free of having mosquito eggs and protecting yourself and your family from dengue.

If you have any questions about taking part in this study, please do not hesitate to contact a member of our research team. We can be contacted on telephone: xxxxx or email: xxxxx

Thank you for taking the time to read about this study.

Yours sincerely, The XXX research team

Department of

Infection and Population Health
University College London,

This study has been approved by the UCL Research Ethics Committee 4784/001

THE ROLE OF MIGRATION PROCESSES IN DENGUE FEVER DETERMINANTS: A CROSS DISCIPLINARY APPROACH

Health and Sanitation professionals - Participant Information Sheet

Research team:

Telephone:

Email:

Dear Sir/Madam

We would like to invite you to participate in the following study with your contribution of your own knowledge and expertise regarding policies in Colombia and dengue.

Do I have to participate?

You should only participate if you wish to; while we would encourage participating, we would emphasize that not choosing to take part will not disadvantage you or your care. Also you can decide to participate and you are able to change your mind later and decide not to. Before you decide whether you want to take part, it is important you to read the following information carefully and discuss with others if you wish. Please contact one of the research team if there is anything that isn't clear or you would like more information.

What is dengue?

Dengue is a disease which produces fever and some discomfort similar to a cold and in some cases ill people can have bleedings. You can get it when a mosquito bites you. In this city the rainy seasons, the temperature and the humidity are related with the existence of mosquitoes and the spreading of dengue.

What is this study about?

We are planning to gather people from the areas of public health, sanitation and urban planning and to hold a group interview-session.

We are interested in meeting with you and your peers to find out about you expertise in Colombian policies in public health/urban planning & development and exploring how these policies have addressed dengue problem in the country knowledge of fevers that affect health. So we would like to invite you to share with us your knowledge and views from your

area of expertise in order to addressing dengue problem and the diverse policies have been developed in the country not only in the area of public health but also in other relevant areas as urban planning and sanitation.

We expected to share the main issues you and other people address, with local health authorities in order they can improve the prevention and control actions against dengue; so we would like to have your permission for sharing this anonymized information with them.

The meeting will be audio recorded; however, when we do the transcriptions (written up) of the meeting, we will use pseudonyms (false name) instead of any names to protecting people's anonymity. Everything that is discussed at the meeting is confidential and anonymous, but we will ask for your consent to participate. The signed consent will be held in the archives at University College London for a two-year period.

Please remember that you do not have to take part in this study or consent us to hold your details in our archives. Participation is entirely voluntary. Whether you choose to not participate in this study, or to participate but later on decide not to continue even though the study wouldn't have finished, you are free to do so and this do not represent any disadvantage for you or your care. Also during the course of this study the researchers might decide not including you contribution to the study, and this does not have any repercussion for you.

So, what are the risk and benefits for you whether you decide to take part of the study? Please read the following paragraph.

What are the risks for me?

This study does not represent any risk for you. The meeting will demand a maximum 2 hours of your time and we are not going to ask you any personal information. Also people from the research team will be at the meetings; in the case you feel uncomfortable with the presence of anyone from the research team you can let us know and he will leave the meeting.

What are the benefits for me?

The indirect benefit for you, from the participation is the possibility to address the problem of dengue and mosquitoes since your area of interest. Also you might be contributing with your expertise to the development of this research. Finally these anonymized results might be useful for Colombian policy-makers in order to improve the policies for tackling dengue.

If you have any questions about taking part in this study, please do not hesitate to contact a member of our research team. We can be contacted on telephone: xxxxx or email: xxxxx

Thank you for taking the time to read about this study.

Yours sincerely, The XXX research team

Department of Infection and
Population and Health
University College London

THE ROLE OF MIGRATION PROCESSES IN DENGUE FEVER DETERMINANTS: A CROSS DISCIPLINARY APPROACH

Meetings - Consent Form

This study has been approved by the UCL Research Ethics Committee [Project ID number]:

Research team:

Telephone:

Email:

Please tick appropriate box:

☐ Yes, I am interested in participating in this study.

☐ No, I do not want to participate in this study.

If Yes, please complete the following:

☐ I have read the Information Sheet about the study.

☐ I understand that I may withdraw myself from the study at any time without giving a reason.

☐ I give consent to researchers for audio record my participation.

☐ I give consent to researchers for sharing with health authorities the anonymized main results getting from the meeting.

☐ I have had the opportunity to ask any questions I wish to ask.

☐ I have the names and telephone numbers of the research team in case I have any queries in the future.

Date _____/_____/_____ *(DAY/MONTH/YEAR)*

Signature:

Department of Infection and
Population and Health
University College London

THE ROLE OF MIGRATION PROCESSES IN DENGUE FEVER DETERMINANTS: A CROSS DISCIPLINARY APPROACH

Surveys- Consent Form

This study has been approved by the UCL Research Ethics Committee [Project ID number]:

Research team:

Telephone:

Email:

Please tick appropriate box:

☐ Yes, I am interested in participating in this study.

☐ No, I do not want to participate in this study.

If Yes, please complete the following:

☐ I have read the Information Sheet about the study.

☐ I understand that I may withdraw myself from the study at any time without giving a reason.

☐ I give consent to researchers for visiting my house and entering to it.

☐ I give consent to researchers for asking me questions and filling up the questionnaire.

☐ I give consent to researchers for measuring vector counts in the water tank.

☐ I give consent to researchers for taking photographs of my house in the case they asked me to do so and I agree with them.

☐ I have had the opportunity to ask any questions I wish to ask.

☐ I have the names and telephone numbers of the research team in case I have any queries in the future.

Date _____/_____/_____ *(DAY/MONTH/YEAR)*

Signature:

Departamento de Infecciones y Salud Poblacional
University College London

Código UCL Comité de Ética 4784/001

El papel del proceso migracional en los determinantes de dengue y en la dinámica de su transmisión: una aproximación transdisciplinaria.
Población local

Grupo de investigación UCL-Fundación Santafé de Bogotá (CEIS)- Universidad Nacional

Teléfono xxx

Email: a.pacheco-coral.11@ucl.ac.uk

Estimado(a) Sr(a)

Queremos invitarlo(a) a participar de este estudio con el aporte de información sobre sus propios conocimientos acerca de la fiebre del dengue. Si decide participar se unirá a un grupo de personas de la zona que serán entrevistadas acerca de sus conocimientos y experiencias respecto al dengue, cuya duración es de aproximadamente 2 horas y que será registrada mediante una grabación.

Es posible que se le invite a una segunda reunión en donde se compartirá con Ud., los resultados que se obtengan de la primera y en donde se le preguntará su opinión acerca de si estos resultados se acercan a lo que Ud., manifestó en dicha entrevista. Su participación es totalmente voluntaria y si decide negarse a participar su estado de salud no se verá afectado de ninguna manera. Por favor contacte a algún miembro del equipo si tiene alguna duda.

Medidas para mantener la confidencialidad: Se mantendrá confidencialidad en todo momento. Su información personal sólo aparecerá al final de este cuestionario al lado de su firma. Sin embargo, este cuestionario no contendrá su nombre a menos que usted decida que lo contenga. Este formato permanecerá con el investigador principal en un lugar seguro y no se compartirá con nadie. La entrevista grabada será entonces escrita usando seudónimos que remplacen cualquier nombre que aparezca durante la entrevista. Los archivos originales serán destruidos una vez las entrevistas hayan sido escritas y archivadas. La información obtenida en la entrevista no se compartirá con nadie. Todo el material que se obtenga de su participación será utilizado con fines educativos e investigativos exclusivamente y utilizando seudónimos. La información obtenida será almacenada en archivos de computador al que sólo accederán los investigadores y que será guardada por un período de dos años en la University College London.

En caso de que el estudio se publique en una revista u otro medio, su nombre ni su información personal será revelada. Los resultados principales de las reuniones se compartirán con las autoridades de salud, si Ud., accede a esto, para que ellos puedan implementar medidas para prevenir y controlar el dengue en la región y mejorar el estado d e salud de los pobladores.

¿De qué se trata este estudio? La fiebre del dengue es un problema de salud que puede afectar a personas que viven en esta zona del país (así como en otras áreas calientes o tibias) y en la que las personas sufren de fiebre y algunas otras molestias.

Nosotros estamos haciendo este estudio con el objetivo de entender las visiones y conocimientos de la gente respecto a la fiebre del dengue, el uso del agua y los mosquitos.

En una primera fase, vamos a invitar a máximo 12 personas a participar de una reunión para que compartan con nosotros sus opiniones y visiones acerca del uso del agua, los mosquitos y las enfermedades febriles. Esta primera reunión tomará 2 horas de su tiempo, se le brindará un refrigerio y además Ud., recibirá un donativo como agradecimiento por su participación en el estudio.

Luego la información será escrita y almacenada en un archivo de computador por parte de los investigadores.

En una segunda fase, se le invitara a participar de una reunión en la que se compartirá con Ud., los resultados obtenidos en la primera y se le preguntará su opinión acerca de dichos resultados. Además se le preguntará acerca de la posibilidad de desarrollar una tercera fase del estudio y sus opiniones al respecto Esperamos contar con su presencia en la segunda reunión que demandará máximo 2 horas de su tiempo y la cual también será audiograbada. En caso de que acepte participar se le brindará de nuevo el formato de consentimiento informado y se mantendrá el mismo proceso de confidencialidad.

Riesgos y beneficios del estudio: No se anticipan riesgos o incomodidades directas con esta investigación. La investigación demandará de 4 horas de su tiempo (una o dos entrevistas) y la presencia del o los investigadores durante algunas de sus interacciones con el equipo. En caso de que no se sienta a gusto con la presencia del o los investigadores puede hacérnoslo saber y nos ausentaremos según usted lo indique.

Beneficios indirectos para usted por la participación en la presente investigación es identificar las opiniones de la comunidad sobre el dengue, su situación al interior de las comunidades y posibilidades de solución. Esta información anónima puede ser utilizada por el gobierno local para mejorar las condiciones de salud de la población en la región y contrarrestar el efecto del dengue.

Participación Voluntaria: Usted puede negarse a participar en este estudio sin ninguna consecuencia. Su participación es totalmente voluntaria. También puede cambiar de parecer y negarse a participar en cualquier momento. El investigador también puede decidir excluirlo(a) de su participación en el estudio en cualquier momento sin repercusiones para usted ni sus cuidados de salud.

Información adicional: Si usted tiene cualquier pregunta adicional acerca de este estudio, puede comunicarse con la investigadora Adriana Pacheco al teléfono xxx

Gracias por su tiempo Grupo de investigación

D epartamento
de Infecciones y Salud Poblacional
University College London

Código UCL Comité de Ética 4784/001

El papel del proceso migracional en los determinantes de dengue y en la dinámica de su transmisión: una aproximación transdisciplinaria.

Grupos etnicos

Grupo de investigación UCL-Fundación Santafé de Bogotá (CEIS)- Universidad Nacional

Teléfono xxx

Email: a.pacheco-coral.11@ucl.ac.uk

Estimado(a) Sr(a)

Queremos invitarlo(a) a participar de este estudio con el aporte de información sobre sus propios conocimientos acerca de la fiebre del dengue. Si decide participar se unirá a un grupo de personas de la zona que serán entrevistadas acerca de sus conocimientos y experiencias respecto al dengue, cuya duración es de aproximadamente 2 horas y que será registrada mediante una grabación.

Es posible que se le invite a una segunda reunión en donde se compartirá con Ud., los resultados que se obtengan de la primera y en donde se le preguntará su opinión acerca de si estos resultados se acercan a lo que Ud., manifestó en dicha entrevista. Su participación es totalmente voluntaria y si decide negarse a participar su estado de salud no se verá afectado de ninguna manera. Por favor contacte a algún miembro del equipo si tiene alguna duda.

Medidas para mantener la confidencialidad: Se mantendrá confidencialidad en todo momento. Su información personal sólo aparecerá al final de este cuestionario al lado de su firma. Sin embargo, este cuestionario no contendrá su nombre a menos que usted decida que lo contenga. Este formato permanecerá con el investigador principal en un lugar seguro y no se compartirá con nadie. La entrevista grabada será entonces escrita usando seudónimos que remplacen cualquier nombre que aparezca durante la entrevista. Los archivos originales serán destruidos una vez las entrevistas hayan sido escritas y archivadas. La información obtenida en la entrevista no se compartirá con nadie. Todo el material que se obtenga de su participación será utilizado con fines educativos e investigativos exclusivamente y utilizando seudónimos. La información obtenida será almacenada en archivos de computador al que sólo accederán los investigadores y que será guardada por un período de dos años en la University College London.

En caso de que el estudio se publique en una revista u otro medio, su nombre ni su información personal será revelada. Los resultados principales de las reuniones se compartirán con las autoridades de salud, si Ud., accede a esto, para que ellos puedan implementar medidas para prevenir y controlar el dengue en la región y mejorar el estado de salud de los pobladores.

¿De qué se trata este estudio? La fiebre del dengue es un problema de salud que puede afectar a personas que viven en esta zona del país (así como en otras áreas calientes o tibias) y en la que las personas sufren de fiebre y algunas otras molestias.

Nosotros estamos haciendo este estudio con el objetivo de entender las visiones y conocimientos de la gente respecto a la fiebre del dengue, el uso del agua y los mosquitos.

En una primera fase, nos gustaría conocer acerca de su experiencia en estas fiebres u otros problemas de salud durante sus viajes antes de asentarse en esta zona. Esta primera reunión tomará 2 horas de su tiempo y se le brindará un refrigerio.

Luego la información será escrita y almacenada en un archivo de computador por parte de los investigadores.

En una segunda fase, se le invitara a participar de una reunión en la que se compartirá con Ud., los resultados obtenidos en la primera y se le preguntará su opinión acerca de dichos resultados. Además se le preguntará acerca de la posibilidad de desarrollar una tercera fase del estudio y sus opiniones al respecto. Esperamos contar con su presencia en la segunda reunión que demandará máximo 2 horas de su tiempo y la cual también será audiograbada. En caso de que acepte participar se le brindará de nuevo el formato de consentimiento informado y se mantendrá el mismo proceso de confidencialidad.

Riesgos y beneficios del estudio: No se anticipan riesgos o incomodidades directas con esta investigación. La investigación demandará de 4 horas de su tiempo (una o dos entrevistas) y la presencia del o los investigadores durante algunas de sus interacciones con el equipo. En caso de que no se sienta a gusto con la presencia del o los investigadores puede hacérnoslo saber y nos ausentaremos según usted lo indique.

Beneficios indirectos para usted por la participación en la presente investigación es identificar las opiniones de la comunidad sobre el dengue, su situación al interior de las comunidades y posibilidades de solución. Esta información anónima puede ser utilizada por el gobierno local para mejorar las condiciones de salud de la población en la región y contrarrestar el efecto del dengue.

Participación Voluntaria: Usted puede negarse a participar en este estudio sin ninguna consecuencia. Su participación es totalmente voluntaria. También puede cambiar de parecer y negarse a participar en cualquier momento. El investigador también puede decidir excluirlo(a) de su participación en el estudio en cualquier momento sin repercusiones para usted ni sus cuidados de salud.

Información adicional: Si usted tiene cualquier pregunta adicional acerca de este estudio, puede comunicarse con la investigadora Adriana Pacheco al teléfono 3103101348.

Gracias por su tiempo

Grupo de investigación

Departamento
de Infecciones y Salud Poblacional
University College London

El papel del proceso migracional en los determinan
de dengue y en la dinámica de su transmisión: un
aproximación transdisciplinaria.
Encuesta en hogares

Código UCL Comité de Ética 4784/001

Grupo de investigación

Teléfono

Email

Estimado(a) Sr(a)

Queremos invitarlo(a) a participar de este estudio con el aporte de información sobre sus propios conocimientos acerca de dengue. Si decide participar se le realizará una encuesta en su hogar por parte de dos investigadores en la que se le preguntará en profundidad acerca de mosquitos, uso del agua en el hogar, características físicas de su vivienda y si ha sufrido o no de fiebre del dengue. Esta encuesta demandará máximo 30 minutos de su tiempo.

Medidas para mantener la confidencialidad: Se mantendrá confidencialidad en todo momento. Su información personal sólo aparecerá al final de este cuestionario al lado de su firma. Sin embargo, este cuestionario no contendrá su nombre a menos que usted decida que lo contenga. Este formato permanecerá con el investigador principal en un lugar seguro y no se compartirá con nadie. La información obtenida en la encuesta no se compartirá con nadie. Todo el material que se obtenga de su participación será utilizado con fines educativos e investigativos exclusivamente y utilizando seudónimos. La información obtenida será almacenada en archivos de computador al que sólo accederán los investigadores y que será guardada por un período de dos años en la University College London.

En caso de que el estudio se publique en una revista u otro medio, su nombre ni su información personal será revelada. Los resultados principales de las reuniones se compartirán con las autoridades de salud, si Ud., accede a esto, para que ellos puedan implementar medidas para prevenir y controlar el dengue en la región y mejorar el estado de salud de los pobladores.

¿De qué se trata este estudio? La fiebre del dengue es un problema de salud que puede afectar a personas que viven en esta zona del país (así como en otras áreas calientes o tibias) y en la que las personas sufren de fiebre y algunas otras molestias.

Nosotros estamos haciendo este estudio con el objetivo de entender las visiones y conocimientos de la gente respecto a la fiebre del dengue, el uso del agua y los mosquitos.

Para esta fase, se escogerán al azar casas en el vecindario y se le preguntara a los moradores si desean participar. De acceder a esto se le visitara a una hora conveniente y se le harán unas preguntas cuyas respuestas serán escritas en un cuestionario. Dichas preguntas estarán relacionadas con conocimientos acerca de fiebre del dengue, antecedentes de enfermedad febril, mosquitos, uso del agua por parte de los moradores y características de la vivienda como ubicación de las áreas húmedas y tanques de agua. Así mismo se le pedirá permiso para entrar y tomar unas muestras de agua de su tanque principal para evaluar si tiene rastros del mosquito que transmite la fiebre del dengue. Es posible que también se le pregunte si nos permite tomar algunas fotos del tanque o de la estructura de su vivienda.

Riesgos y beneficios del estudio: No se anticipan riesgos o incomodidades directas con esta investigación. La investigación demandará de 30 minutos de su tiempo y la presencia del o los investigadores durante algunas de sus interacciones con el equipo. En caso de que no se sienta a gusto con la presencia del o los investigadores puede hacérnoslo saber y nos ausentaremos según usted lo indique.

Beneficios indirectos para usted por la participación en la presente investigación es identificar las opiniones de la comunidad sobre el dengue, su situación al interior de las comunidades y posibilidades de solución. Esta información anónima puede ser utilizada por el gobierno local para mejorar las condiciones de salud de la población en la región y contrarrestar el efecto del dengue.

Participación Voluntaria: Usted puede negarse a participar en este estudio sin ninguna consecuencia. Su participación es totalmente voluntaria. También puede cambiar de parecer y negarse a participar en cualquier momento. El investigador también puede decidir excluirlo(a) de su participación en el estudio en cualquier momento sin repercusiones para usted ni sus cuidados de salud.

Información adicional: Si usted tiene cualquier pregunta adicional acerca de este estudio, puede comunicarse con los investigadores a los teléfonos Adriana Pacheco al teléfono 3103101348.

Gracias por su tiempo

Grupo de investigación

Departamento
de Infecciones y Salud Poblacional
University College London

Código UCL Comité de Ética 4784/001

El papel del proceso migracional en los determinan
de dengue y en la dinámica de su transmisión: un
aproximación transdisciplinaria.

Entrevistas

Grupo de investigación UCL-Fundación Santafé de Bogotá (CEIS)- Universidad Nacional

Teléfono xxx

Email: a.pacheco-coral.11@ucl.ac.uk

Estimado(a) Sr(a)

Queremos invitarlo(a) a participar de este estudio con el aporte de información sobre sus propios conocimientos acerca de la fiebre del dengue y su prevención y control. Si decide participar se le realizará una entrevista cuya duración es de máximo 1 hora y que será registrada mediante una grabación.

Medidas para mantener la confidencialidad: Se mantendrá confidencialidad en todo momento. Su información personal sólo aparecerá al final de este cuestionario al lado de su firma. Sin embargo, este cuestionario no contendrá su nombre a menos que usted decida que lo contenga. Este formato permanecerá con el investigador principal en un lugar seguro y no se compartirá con nadie. La entrevista será transcrita y su nombre no será usado. Una vez se finalice la transcripción los archivos digitales de audio serán destruidos. La información obtenida en la entrevista no se compartirá con nadie. Todo el material que se obtenga de su participación será utilizado con fines educativos e investigativos exclusivamente y utilizando seudónimos. La información obtenida será almacenada en archivos de computador al que sólo accederán los investigadores y que será guardada por un período de dos años en la University College London.

En caso de que el estudio se publique en una revista u otro medio, su nombre ni su información personal será revelada. Los resultados principales de las reuniones se compartirán con las autoridades de salud, si Ud., accede a esto, para que ellos puedan implementar medidas para prevenir y controlar el dengue en la región y mejorar el estado de salud de los pobladores.

¿De qué se trata este estudio? La fiebre del dengue es un problema de salud que puede afectar a personas que viven en esta zona del país (así como en otras áreas calientes o tibias) y en la que las personas sufren de fiebre y algunas otras molestias.

Nosotros estamos haciendo este estudio con el objetivo de entender las visiones y conocimientos de la gente respecto a la fiebre del dengue, el uso del agua y los mosquitos.

Para esta fase se le está pidiendo participación a personas que hayan trabajado en áreas de la salud, el saneamiento ambiental y políticas de atención a población

desplazada para que desde su experticia puedan narrarnos como ha sido la integración de las políticas del control y la prevención del dengue en la región y si ha sido posible que estas incluyan a las personas desplazadas o si en las políticas de atención a población desplazada se ha incluido al dengue como una prioridad en salud.

Riesgos y beneficios del estudio: No se anticipan riesgos o incomodidades directas con esta investigación. La investigación demandará de 30 minutos de su tiempo y la presencia del o los investigadores durante algunas de sus interacciones con el equipo. En caso de que no se sienta a gusto con la presencia del o los investigadores puede hacérnoslo saber y nos ausentaremos según usted lo indique.

Beneficios indirectos para usted por la participación en la presente investigación es que su experiencia, conocimientos y trabajo puede contribuir a identificar otros determinantes de la transmisión del dengue en Colombia y a generar posibles soluciones para contrarrestar esta enfermedad. Esta información anónima puede ser utilizada por el gobierno local para mejorar las condiciones de salud de la población en la región y contrarrestar el efecto del dengue.

Participación Voluntaria: Usted puede negarse a participar en este estudio sin ninguna consecuencia. Su participación es totalmente voluntaria. También puede cambiar de parecer y negarse a participar en cualquier momento. El investigador también puede decidir excluirlo(a) de su participación en el estudio en cualquier momento sin repercusiones para usted ni sus cuidados de salud.

Información adicional: Si usted tiene cualquier pregunta adicional acerca de este estudio, puede comunicarse con los investigadora Adriana Pacheco al teléfono xxx

Gracias por su tiempo

Grupo de investigación

Departamento de Infecciones y Salud Poblacional
University College London

Código UCL Comité de Ética 4784/001

El papel del proceso migracional en los determinantes de dengue y en la dinámica de su transmisión: una aproximación transdisciplinaria.

Grupos focales y entrevistas –Consentimiento informado

Grupo de investigación UCL-Fundación Santafé de Bogotá (CEIS)- Universidad Nacional

Teléfono xxx

Email: a.pacheco-coral.11@ucl.ac.uk

Por favor marque con una X el cuadro, cuando lo considere apropiado:

☐ **Si**, estoy interesado(a) en participar en este estudio.

☐ **No**, yo no deseo participar en este estudio.

Si marco si, por favor continúe

☐ He leído la información acerca del estudio

☐ Entiendo que puedo abandonar el estudio en cualquier fase del mismo.

☐ Doy permiso a los investigadores para grabar mi entrevista o participación en el grupo

☐ Doy permiso a los investigadores para compartir los resultados principales anónimos, de esta entrevista o participación en grupo, con las autoridades de salud

☐ He tenido la oportunidad de realizar las preguntas del caso

☐ Yo tengo los números de contacto de los investigadores, para comunicarme con ellos en el futuro

Fecha _____/_____/_____

Firma: _____

Firma del investigador: _____

D epartamento de Infecciones y Salud Poblacional
University College London

Código UCL Comité de Ética 4784/001

El papel del proceso migracional en los determinantes de dengue y en la dinámica de su transmisión: una aproximación transdisciplinaria.

Encuesta en hogares – Consentimiento informado

Grupo de investigación

Teléfono

Email:

Por favor marque con una X el cuadro, cuando lo considere apropiado:

☐ **Si**, estoy interesado(a) en participar en este estudio.

☐ **No**, yo no deseo participar en este estudio.

Si marco si, por favor continúe

☐ He leído la información acerca del estudio

☐ Entiendo que puedo abandonar el estudio en cualquier fase del mismo.

☐ Doy permiso a los investigadores para visitar mi casa e ingresar a ella

☐ Doy permiso a los investigadores para hacerme preguntas y llenar el cuestionario

☐ Doy permiso a los investigadores para tomar muestras de agua de mi tanque principal

☐ Doy permiso a los investigadores para tomar fotos al interior de mi vivienda

☐ He tenido la oportunidad de realizar las preguntas del caso

☐ Yo tengo los números de contacto de los investigadores, para comunicarme con ellos en el futuro

Fecha _____/_____/_____

Firma: _____

Firma del investigador: _____

UCL RESEARCH ETHICS COMMITTEE
GRADUATE SCHOOL OFFICE

Dr Andrew Cunliffe Hayward

Department of Infection and Population Health
Royal Free Hospital

Rowland Hill Street

London

NW3 2PF

25 September 2013

Dear Dr Hayward

Notification of Ethical Approval

Project ID: 4784/001: The role of migration processes in dengue fever determinants: a cross disciplinary approach

I am pleased to confirm that your study has been approved by the UCL Research Ethics Committee for the duration of the project i.e. until September 2014.

Approval is subject to the following conditions:

1. You must seek Chair's approval for proposed amendments to the research for which this approval has been given. Ethical approval is specific to this project and must not be treated as applicable to research of a similar nature. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing the 'Amendment Approval Request Form'.

The form identified above can be accessed by logging on to the ethics website homepage: http://www.grad.ucl.ac.uk/ethics/ and clicking on the button marked 'Key Responsibilities of the Researcher Following Approval'.

2. It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. Both non-serious and serious adverse events must be reported.

   Reporting Non-Serious Adverse Events

   For non-serious adverse events you will need to inform Helen Dougal, Ethics Committee Administrator (ethics@ucl.ac.uk), within ten days of an adverse incident occurring and provide a full written report that

should include any amendments to the participant information sheet and study protocol. The Chair or Vice-Chair of the Ethics Committee will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

Reporting Serious Adverse Events

The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator immediately the incident occurs. Where the adverse incident is unexpected and serious, the Chair or Vice-Chair will decide whether the study should be terminated pending the opinion of an

independent expert. The adverse event will be considered at the next Committee meeting and a decision will be made on the need to change the information leaflet and/or study protocol.

On completion of the research you must submit a brief report (a maximum of two sides of A4) of your findings/concluding comments to the Committee, which includes in particular issues relating to the ethical implications of the research.

With best wishes for the research.

Yours sincerely

Professor John Foreman

Chair of the UCL Research Ethics Committee

Cc:

Adriana del Pilar Pacheco-Coral, Applicant Dr Richard Gilson

t INIvERsiDAD NACIONAL DE COLOMBIA

SEDE BOGOTA
FACULTAD DE MEDICINA
COMITE DE ETICA

ACTA DE EVALUACIoN

CE—003

ACTA DE EVALUACION: Al". 022

Ferlir$: 13 *tle junlo de 2013*

Nombre completo del proyecto: "EL PAPEL DEL PROCESO MIGRACIONAL EN LOS DETERMINANTES DE DENGUE YEN LA DINAMICA DE SU TRANSMISION: UNA APROXIMACION TRANSDISCIPLINARM (THE ROLE OF MIGRATION PROCESS IN DENGUE DETERMINANTS AND DYNAMICS OF TRANSMISSION: A CROSS DISCIPLINARY APROACH)",

Version neimero: 01

Sometido por: la estudiante Adriana Pacheco Coral

Present ado por: e1 prafesor German Enrique Perez

Departamento o SeccIdn: Medicina Interna

Fecha en que file sometido a consideration del Comite: 13 de junio de 2013

El COMITE DE ETICA DE INVESTIGACION DE L4 FACULTAD DE MEDICINA. Se constituyO mediante la Resolution 152, (Acta No. 43 del 5 de diciembre de 1996 actualizodo mediante resolution 008 (acta 03 de 27 de enero de 2011), de Consejo de Facultad el Comite de Etica de investigacion, el coal esta regido por In Result/cif5n 00,9430 del 4 de octubre do 1993 del Ministerio de Salud de Colombia clue estableclo las norm as cientificas, tecnicas y administrotivas pars to InvestigaciOn en salud; los principios de In Asnmblen Medico Mundial expuestos en so Dednracion de Helsinki de 1964, Ultima revision del ono 2000; y el codigo de regulaciones federates, titulo 45, parte 46, port, in protection de los sujetos humonos, del departamento de salud y servicios hurnanos de los institutos Naclonales de Salud de los Estados Unidos (Juni° 18 de 1991).

El Comite de Etica de la Facultad de Medicina certifica clue:

1. Sue miembros revisaran los siguientes documentos del presente proyecto:

- ✓ Carta *de presented& do!* proyecto *generada par In unidad basica a el departamenta*
- ✓ *Copia de la evaluacion de los jurados o pares academicos qua evaluaron y aprobaron el trabajo. Capin del proyecto rnmpleto do Investlyncidn.*
- ✓ *Dos resumenes ejecutivos.*
- ✓ *Dos copias del consentimiento inform ado (en espahol y cuando la investigation lo amerite.*
- ✓ *f* total' *dE* viria re= (dal *cfr fuz InvestIgurfares y colnuestigedores del* proyecto.
- ✓ *Consideraciones eticas segUn resolution 8430 Ministerio de Salud.*
- ✓ *Resultados de evaluacion por otros comites (Si aplica)*

2. El presente proyecto foe evalaado y aprobado por los sigulentes miembros del Comite:

1	*Arstizabal Chantal*	*Miembro Extern° de La Comunidad Cientifica*
2	*Arteaga Diaz Clara Eugenia*	*Coordinadora Maestria en Genetics Humana*
3	*Chaverra Menu Damiuno*	*Asesora Juridica Facultad de Medicina*
4	*Gomez Sandra Paola*	*Representante de los pacientes*
5	*Guerrero Fonseca Carlos Arturo*	*Fresidente Comite de Etica Departamento de Ciencias Fisiologicas*

Eib/. Jeannette P. Al.-

UNIVERS1DAD NACIONAL DE COLOMBIA
SEDE BOGOTA

FACULTAD DE MEDICINA
COMTE DE ETICA
ACTA DE EVALUACION

qtre *el prewite 6'511idk);*

a.Es valid° desde el pun to vista erica. La investigaciOn involucra un riesgo igual al promedio para los sujetos que participan en Oa. La investigation se ajusta a los estandares de la buena proctica clinica.

LEl Comite considera que las medidas que eston siendo tornados pore proteger a

los sujetos humonos son adecuodas 4. El Comite informarci inmediatamente a las

directivas institucionales:

a. *Todo desacato de los investigadores a las solicitudes del Comite.*
b. *Cualquier suspension o termlnoekin de fa aprOboacin par parte del Comite.*

S. El Comite informara inmediatamente a las directives, toda information que redba acerca de:

a. Lesiones o deflos a sujetos humanos con motivo de su participaciOn en la investigation Problemas imprevistos que involucren riesgos para los sujetos u otras personas.

CE■ohluier ctanbio o modi icfleiS17 a este proyecto que haya sido revised° y °probed° par este comite

S. Cuando el proyecto sea aprobado, sera par an period° de an (1) ono a punk de la lecho de aprobaciOn.

7. El Mvestigador principal debera:

a. *Informer de rualquier* ***rombin*** *quo se proponga introducir en of proyecto. Estos camblos no podran ejecutarse sin lo aproboden previa del COMTE' DE ETICA DE LA FACULTAD DE MEDICINA) excepto cuando scan necesorios par° minimizar o suprimir un peligro inminente a un riesgo grave para los sujetos que* participan *en* 1a investigaddrn.
b. *Avisar de cualquier situation imprevisto que se considere implied algdn signo de riesgo para los sujetos o la comunidod o el media en el coal se Ileva a cabo el estudio.*
c. *informar de cualquier even to adverso serio de algtin paciente, comunicando la situation al secretario y of presidente del Comite de Etica), de acuerdo con la normatividad que of INWMA a generado a este respect°.*

Poner en conocimiento del comite toast informackin nueva importante respect° ai *estudio, que pueda afectar la relackin riesgolbeneficio de los* sujetos *participantes.*

e. Comunicar cualquier decision tornado par otros remit& con respecto a la investigation que se Ileva a cabo.

f Informer de la termination premature o suspension del proyecto explicando las causes o razones.

g. Presentar a este comite un informe cuando hoya transcurrido on alio, contado a partir de la aprobaciOn del proyecto. Los proyectos con duracitin mavor a on Mn, serfin reevoloodob a partir del informe de ovance integrado.

Tadas los proyectos deben entregar al finalize(un informe final de cierre del estudio, este cierre puede ser el informe final en formate complete a en format° de resumen de cierre de estudio, furnace par el investigador responsable del estudio.

8. Observaclones:

to de investigacion no present° dilemas eticos por lo tan to emite Concept° Aprobatorio.

GUERRERO FONSECA

Tit 'ho Duct oradoNIlloquirruca.MSc, en Formacologia y MSc. en Genetic° Humana

Cargo: Presidente Comite e Etica

Elb/. Jeannette P. Al.-

C
arrera 30 No. 45.03, FACULTAD DE MEDICINA, Edificio 471 Piso 4s, Oficina 401
Telefono: (57.1) 316 5251tonmutador; (57.1) 816 5000 Ext. 15167 _1500&
Correo electronico: eticasaluci fmbogOunal.edo.co
Bogota, Colombia, Sur America

El comite consider

Appendix 4 Examples of types of containers in peoples' households which might be used as breeding sites by dengue vector

Figure 55 Example of cement tank type A, small containers (buckets, jars) partially covered by the households' roof

(Pacheco, 2008)

Figure 56 Example of cement tank type B in the backyard of a household

(Author's photographic file, 2015)

Figure 57 Example of elevated tanks covered with lid

(Author's photographic file, 2015)

Figure 58 Examples of elevated tanks covered with lid

(Author's photographic file, 2015)

Figure 59 Examples of flower vases found in participant's households

(Author's photographic file, 2015)